

The logo for the Pakistan Development Review (PDR) features the letters 'P', 'D', and 'R' in a stylized, bold font. The 'P' is green, the 'D' is red, and the 'R' is blue. They are arranged horizontally and slightly overlap.

The PAKISTAN DEVELOPMENT REVIEW

ARTICLES

Pervez Zamurrad Janjua, Ghulam Samad, and Nazakat Ullah
Intellectual Property Rights (IPRs) and Economic
Growth in Pakistan

Karim Khan and Anwar Shah
Dictatorships, Patronage and Public Good Provision:
Some Empirics

Ghulam Ghouse, Saud Ahmed Khan, and Muhammad Arshad
Volatility Modelling and Dynamic Linkages between Pakistani and Leading
Foreign Stock Markets: A Multivariate GARCH Analysis

Faiz Ur Rehman
The Production of Terrorism in Pakistan:
A Religious Market Explanation

Ahsan Abbas, Eatzaz Ahmed, and Fazal Husain
Political and Economic Uncertainty and Investment
Behaviour in Pakistan

BOOK REVIEW

**Rashid Amjad (ed.). *The Pakistani Diaspora: Corridors of
Opportunity and Uncertainty***
Reviewed by *Usman Ahmad*

Intellectual Property Rights (IPRs) and Economic Growth in Pakistan

PERVEZ ZAMURRAD JANJUA, GHULAM SAMAD, and NAZAKAT ULLAH

The strong protection of Intellectual Property Rights (IPRs) attract more investments and promote economic growth processes in developing countries. This study underlines the level of IPRs enforcement in Pakistan and consequently its implications for economic growth. The study confirms that enforcement at appropriate level of IPRs encourages economic growth in Pakistan. For data stationarity and long-run relationship between IPRs and economic growth Unit Root test and Johansen Cointegration tests are applied. The study uses Times Series data estimation techniques, namely Vector Error Correction Model (VECM) for a period of 1970–2010. The study concludes with policy recommendations for economic growth in understanding the form and nature of IPRs enforcements in Pakistan.

Keywords: Intellectual Property Rights (IPRs), Foreign Direct Investment (FDI), Research and Development, Patents, Human Capital, Invention and Innovation

1. INTRODUCTION

IPRs relate to the products of human mind. These products are intangible and valuable products and they can be used to fulfil diverse human need. They may include inventions, industrial designs, copy rights, literary or artistic works, programmes, trade marks and images used in trade, etc. IPRs can be traded, licensed or transferred similarly as the tangible products. IRPs are considered as factor which may, along with other factors, enhance economic growth. The channels of growth through IPRs can be internal as well as external. Internal channel includes all product of mind created in the domestic market, whereas external channel includes the products produced in external market. The predominance of a particular channel depends on the level of development of a country. IPRs through internal channel are dominant in developed countries and through external channel in developing countries. The range of products related to IPRs is very wide in developed countries. In developing countries, it is usually limited to a set of products through internal and external channels.

It is argued that enforcement of property rights as well as intellectual property rights encourage investments in research and development, which may lead to improve output through inventions and innovations [Maskus and Fink (2005) and Falvey, *et al.*

Pervez Zamurrad Janjua <pzjanjua@hotmail.com> is Head, Department of Economics, Princeton University, Islamabad. Ghulam Samad <ghulam.samad@fulbrightmail.org> is Research Economist, Pakistan Institute of Development Economics, Islamabad. Nazakat Ullah <nazakatkhan_82@yahoo.com> is Research Associate/Freelancer.

(2006)]. Enforcement of intellectual property rights enables the inventors/innovators to produce invented/innovated products. The profit accrued out of the sale of invented/innovated products covers the costs of production and provides incentive or reward for invention/innovation. IPRs can promote economic growth through different channels. The most important channel is technology transfer and its positive spillover. Efficient protection of IPRs leads to technological innovation and improvement in total factor productivity which is most significant factor of economic growth [Rapp and Rozek (1990)].

A number of authors, although acknowledges the positive role of invention and innovation in economic growth, yet they are sceptical about the positive impact of enforcement of intellectual property rights on economic growth as a general rule [e.g. Nair-Reichert and Duncan (2002)]. Not only improvement in technology but also diffusion of technology plays an important role in the growth process. According to Yueh (2007) IPRs create an artificial monopoly to promote innovation but also make the technology diffusion costly, which increases the cost of production for developing countries and inhibit their ability to “catch up” developed countries in terms of economic growth. Some authors argue that the cost of innovation in relation with the cost of imitation of technology vary along with the level of development in different economies [Fink and Braga (2005); You and Katayama (2005); Falvey, *et al.* (2006)]. More specifically, in middle income countries like Pakistan, the cost of imitation is lesser than the cost of innovation. Therefore, in these countries enforcement of strong intellectual property rights may have negative impact on economic growth [Janjua and Samad (2007)].

The purpose of this study is to assess the nature of relationship between IPRs and economic growth in Pakistan. Specific objectives are to analyse whether the enforcement of IPRs in general and at different levels of per capita income in particular, has significantly impacted the economic growth in Pakistan? In addition, this study will develop a platform for future studies on IPRs and economic growth in Pakistan. We understand that the recommendations of this study will be more valuable not only for national but international policy-makers. Most of the studies have analysed the relationship between IPRs and economic growth by considering cross countries panel data. The significance of this study is that we are considering time series data to ascertain the relationship between IPRs and economic growth in Pakistan, which has not been used by any study to the best of our knowledge.

We applied a unique patent data set provided by Walter Park¹ on personal request. For data stationarity and long-run relationship between IPRs and economic growth Unit Root test and Johansen Cointegration tests are applied. The study uses Times Series data estimation techniques, namely Vector Error Correction Model (VECM) for a period of 1970–2010. The study confirms that enforcement at appropriate level of IPRs encourages economic growth in Pakistan.

The rest of the paper is organised as follow. In Section 2, we described IPRs and policy environment in Pakistan. We then presented the literature review in Section 3. The methodological framework is presented in Section 4. Econometric methodology are outlined in Section 5. Section 6 presents the conclusion and recommendations of the study.

¹Prof. American University USA.

2. IPRs AND POLICY ENVIRONMENT IN PAKISTAN

The enforcement of IPRs in Pakistan has been very slow. After independence the share of IPRs products in total output was negligible. However, its share increased over time. In the year 2000 alone copyright industries contributed about 4.45 percent to the GDP. Irrespective of this contribution the demand for copyright products in the domestic market is far greater than the supply, therefore Pakistan was net importer of copyright based products to the tune of 787 million US\$ in the year 2007-2008 [WIPO (2010)].

A relatively low contribution of IPRs in national output has been caused by different factors. Firstly, level of literacy in the country has been very low. Secondly, the role of innovation in economic growth was not generally recognised. Thirdly, producers and investors were interested to maximise profits through traditional and import-substitution products due to incentives created by the policy-makers. Fourthly, a mechanism of reward and punishment to protect IPRs was not effectively evolved due to low level of good governance. Fifthly, growth of corporate business in Pakistan has been very slow which is usually considered as an engine of research and development as well as innovation and growth.

The Government of Pakistan took various measures to protect IPRs. The Patents and Designs Office was established in Karachi in 1948 under Patents and Design Act of 1911. The office accepts applications for registration and renewal of patents, industrial designs and layout designs of integrated circuits. In the last 25 years the office dealt with 25000 patent cases and 15000 cases of industrial designs. Similarly, Trademarks Registry Office was established in Karachi in 1948 under the Trade Marks Act 1940. The registry deals with trademarks and geographical indications and publishes a trademarks journal. The examination of applications usually took 30 months which are now reduced to 3 months after automation but still 18-24 months period is required for the issuance of registration certificates. The Copyright Office was established in Karachi in 1963 under the Copyright Ordinance 1962 and later on a branch office was opened in Lahore in 1984. The office registers IPRs including literary and artistic works, cinematographic works, music, publishing and computer programmes. Till 2009 the office registered 20124 cases including 14249 cases for artistic works, 4728 for literary works, 1040 for recorded works and 107 for cinematographic works [IPO (2009)].

Effective protection of IPRs can attract more investment, promote export, protect consumers and improve prospect for economic growth. Protection of IPRs can be secured through effective management of technology that include creation, transfer of technology. Therefore, Intellectual Property Rights Organisation (IPO) of Pakistan was established in 2005 to achieve this goal. IPO identified following IPRs for Pakistan [IPO (2009)]:

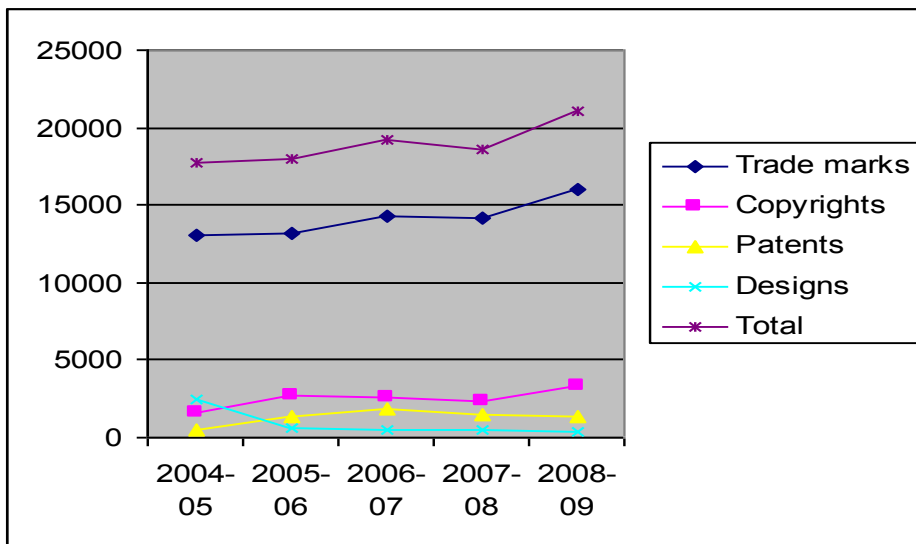
- (1) Patents: Right of researchers and innovators to exclude others from commercialisation of certain innovated products. They encourage innovation and enable public access to innovation.
- (2) Trade marks: These are signs and words that distinguish products of one business from others. They are useful to promote quality products. These rights encourage competition and protect business from counterfeiting.
- (3) Copyrights: Exclusive rights of the inventors to copy their works or products. They include literary and artistic works, computer programmes, data bases, paintings, films, music, sculptures, etc.

- (4) Industrial designs: These rights protect specific ornamental and aesthetic aspects of articles having two or three dimensional features.
- (5) Geographical indications: These rights are used to protect certain names or signs due to their geographical origin. These rights may encourage preservation of high quality traditional products.
- (6) Integrated circuits: They are microcircuits or microchips which are used in electronic equipments. These rights are similar to patents.
- (7) Plant breeder rights: These rights are used to protect the breeders for the development of new breeds (plants). These rights encourage innovation and improve farm productivity.
- (8) Genetic resources: These rights refer to any material of plants, animal, microbial or other origin having functional units of heredity.

(The above defined different types of IP rights 1-8 are governed under certain Acts and Ordinances. Since the focus of the study is mainly on the enforcement of IPRs, so include all those articles which support the objective the study).

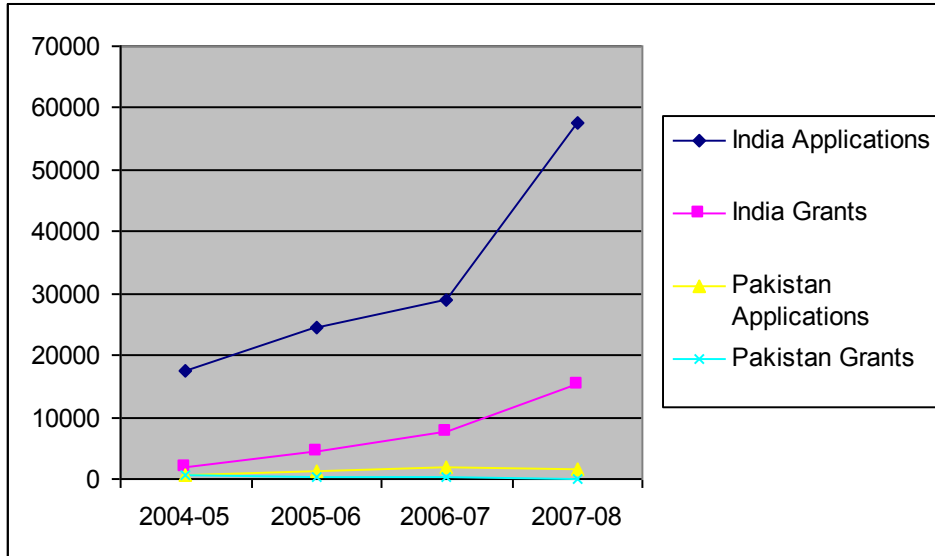
IPO aims to ensure integrated management of technology and enforcement coordination of all types of IPRs which were previously under the domain of different ministries and registries. Moreover, Federal Investigation Agency (FIA) was empowered to eliminate piracy by including copyright legislation in the FIA Act 1974. Similarly, Pakistan Customs was activated to control counterfeiting and piracy. Thus, IPO Pakistan has developed data base and it is registering, updating and displaying IPRs in its official gazette, journal and website. Recently, it has introduced E-Filing & Receipt System for prompt and transparent acknowledgement of IPRs applications and renewal of IPRs within a specified time limit.

IPO is showing increasing trends for registration of IPRs for trademarks and copyrights but for patents and industrial designs the figures show declining or stagnant trend in recent past:



Source: IPO Pakistan, Annual Report 2009:30-31.

The sluggish scenario of development of IPRs in Pakistan becomes evident, if we compare the numbers of applications received and sanctioned for patents in Pakistan and India:



Source: IPO Pakistan, Annual Report 2009:30-31; IP India, Annual Report 2009-10:6.

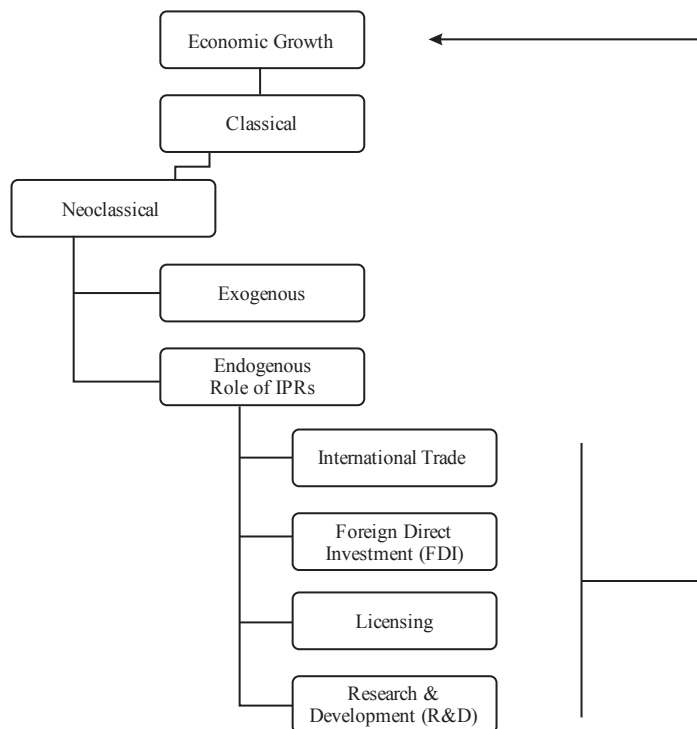
Pakistan is signatory to the Berne Convention (1886), Universal Copyright Convention (1952), Rome Convention (1961) and it has signed the Trade Related Intellectual Property Rights (TRIPS) Agreement with the World Trade Organisation (WTO) in 1994. Thus, it is obliged to protect IPRs through comprehensive legislative and management related mechanism. Reorganisation of integrated IPRs management is a positive step, yet most of the operative systems for the protection of patents, designs, trademarks and copyrights, are still limited in space and scope. Although IPO is operating on self-finance basis and it is expanding in physical and financial terms, yet its basic purpose is neither to generate revenues nor to get international recognition, but to create incentives for investments and innovation, which may lead the country to a higher level of economic growth. Therefore, the question remains to be answered is how far the integrated management of IPO has contributed towards attracting more investment for economic growth of Pakistan?

3. REVIEW OF LITERATURE

Like classical economists, neoclassical authors acknowledge the positive role of saving, population growth and technological progress to raise productivity that leads to economic growth [Solow (1956)]. However, Solow considered technology as an exogenous factor of economic growth (reference). In contrary, the proponents of endogenous growth theory emphasise on productivity that can be raised through development of human capital and innovation. According to Romer (1986) positive growth rates can be achieved through investment in knowledge creation and technology growth.

Lucas (1988) and Barro and Sala-i-Martin (1995) broadened the neoclassical model of economic growth from physical to human capital. Becker (1993) defined human capital as “embodied knowledge and skill”. Human capital can affect economic growth directly as a factor of production and indirectly through accelerating the rate of accumulation of other productive factors. Benhabib and Spiegel (1994) conclude that changes in schooling capital are related to technological growth. A number of authors discussed various channels of technological growth including the protection of intellectual property rights, stimulation of invention and innovation, market deepening, quality enhancement, diffusion of knowledge as well as research and development [Zipfel (2004); Maskus and Fink (2005) and Favelly, *et al.* (2006)].

The linkage between intellectual property rights (IPRs) and economic growth is illustrated in the following figure [Janjua and Samad (2007)]:



The above illustration and this paper mainly consider the linkage of first 4 IPRs identified by IPO Pakistan, because these IPRs are traditionally well recognised in most countries including Pakistan. The combined effect of protection of IPRs stimulates research, invention, innovation, trade and investment through internal and external channels that accelerates economic growth [Janjua and Samad (2007)].

Intellectual property rights affect international trade through the movement of knowledge based products and the trade has a strong relationship with economic growth [Maskus and Fink (2005)]. Patents not only promote competition among businessmen but the patent holders have to compete each others to improve invention and innovation. The

net impact of patents on trade depends on market expansion effect and market power effect. Trade flows may decrease in case of dominant market power effect. However, market expansion effect as an outcome of strengthened IPRs may lead to increase trade. [Raffiquzzaman (2002)].

Many economists emphasise the important role of foreign direct investment (FDI) and licensing in the economic growth process. These international flows enable access to technological and managerial assets and expertise of multinational concerns [Yang and Maskus (1998)]. Protection of IPRs and level of development in a country may influence foreign direct investment and economic growth [Mansfield and Lee (1996); Seyoum (1996)]. In his empirical analysis Javorcik (2004) provided evidence that the extent of IPRs protection in a host country affect the composition of FDI. Weak IPRs may divert FDI projects from manufacturing to service sector. Maskus and Fink (2005) ascertained that the level of FDI depends on the nature of technology available in the host country. Foreign investments in low technology spheres (e.g. textile, assembly, distribution, etc.) depend little on strong IPRs regime rather more on input factors cost. However, FDI can be enhanced through factors like liberalisation, deregulation, technology development and competition.

A vast literature is found to advocate the positive role of research and development (R&D) in the growth process [Soete (1981)]. Social returns to research and development are substantially higher than private returns. These returns not only explain us the role of R&D in growth process, but also provide us justification for governmental subsidy to research and development [Griffith (2000)]. Economic theory and empirical studies provide us ample evidence about significant positive effect of research and development on total factor productivity (TFP) and economic growth [Coe and Helpman (1993); Easterly and Levine (2000)].

The welfare impact of stronger protection of intellectual property rights depends on the level of development of an economy. In a country with limited capacities for innovation and production higher protection of IPRs may improve welfare if it allows to access products which were not possible to access without protection of IPRs. However, in a country with greater capacities for imitation and production but with limited capacities for innovation through research and development, stronger protection of IPRs would likely to repel domestic producers, raise prices and transfer rent from domestic consumers and producers to foreign titleholders resulting in a negative welfare impact [Fink and Braga 2005]. Empirical studies provide evidence that in middle income countries strong enforcement of IPRs may negatively affect economic growth process [e.g. Janjua and Samad (2007)].

In a recent study Sattar and Mahmood (2011) ascertained a positive significant relationship between IRPs and economic growth for a panel of 38 countries. The impact is most effective in high income countries, it is more effective in upper middle countries than in lower middle income countries and it is least effective in low income countries.

Most of the studies have ascertained a positive relationship between IPRs and economic growth. Some authors are of the view that enforcement of IPRs create monopoly powers and increase the cost of technology diffusion. Other authors argue that the positive relationship between IPRs and economic growth depends on the level of development of a country. Therefore, the literature on the relationship between IPRs and economic growth is not conclusive.

4. METHODOLOGICAL FRAMEWORK

4.1. Data and Its Sources

This study uses time series annual data from 1970 to 2010. We intended to decompose data on 5 years' basis in three distinct periods for the purpose of analysis. The first 30 years' data (1970-2000) represent first period with traditional disintegrated system of IPRs management and low level of per capita income in Pakistan. In second period data between 2000 and 2005 reflects Pakistan with same IPRs management but during this period Pakistan achieved the status of middle income country. In the third period the data between 2005 and 2010 represent an integrated IPRs management system in Pakistan being a middle income country. However, irrespective of this categorisation we are considering the level data from 1970 to 2010 due to limited availability of data for time slots from 2000 to 2005 and from 2005 to 2010 for time series analysis.

The data of GDP, FDI, trade to GDP and population growth rate are taken from World Banks's World Development Indicators (2010).² The data of Secondary School Education is obtained from Barro and Lee (2010)³ Intellectual Property Right data is collected from Ginarte and Park (2010).⁴ Economic Freedom of the World data has been collected from Gwartney, *et al.* (2015).⁵

4.2. Selection of Variables

The economic variables selected for the study are presented in the following table:

<i>Definitions of Economic Variables Used in the Study</i>	
GDP	Growth rate of Gross Domestic Production is the market values of all the final goods & services produced within a given period in Pakistan.
IPR	The IPR index [Ginarte and Park 1997]) is based on extent of coverage of patents, duration of protection, duration of membership in international patents agreements, provisions for loss of protection and enforcement mechanisms. Each category has score between 0, 1 and sum of all categories constitutes IPR index which ranges between 0 and 5.
FDI	Foreign direct investment is the investment made by foreign companies in Pakistan.
EFW	Economic Freedom of the World is the index which measure the security of private property right, rule of law, taxes, monetary policy, labour and business regulation etc. EFW index ranges from 0 to 7.
TRADEOP	Trade to GDP is the average ratio of import plus export to GDP.
P _{op} Growth	Population growth is the over time change in population.
SYR ₁₅	SYR15 is the average year of secondary education for people over 15 years of age in Pakistan used as a proxy for human capital.
GDI	Gross domestic investment is the worth of attainment of new or existing fixed assets by the business, government and household sector.

² <http://data.worldbank.org/data-catalog/world-development-indicators>

³ <http://www.barrolee.com>

⁴ This data is available on the request from the authors.

⁵ http://www.freetheworld.com/datasets_efw.html

4.3. Modelling IPRs and Economic Growth

The general form of our model is as follows;

$$\text{GDP} = \beta_1 + \beta_2 \text{IPR} + \beta_3 \text{FDI} + \beta_4 \text{EFW} + \beta_5 \text{TRADEOP} + \beta_6 \text{PopGrowth} + \beta_7 \text{SYR}_{15} + \beta_8 \text{GDI} + U_i \quad (1)$$

5. ECONOMETRIC TECHNIQUES AND ESTIMATIONS

5.1. Unit Root Test

To check the stationarity of all variables we are applying Augmented Dickey-Fuller test and Phillips Perron tests. The results of the tests are demonstrated in Table.1. In time series analysis the linear combination of two or more non-stationary series becomes stationary which is called cointegration in order to avoid spurious results. The objective of Johansen Cointegration test is to trace whether such non-stationary linear combination of variables are cointegrated or not. The presence of cointegration among the variables provides basis for the application of Vector Error Correction Model. The main objective of the stationarity test is to find that how many times the variables are differentiated to induce the stationarity. If the variables are integrated of the same order then we apply Johansen cointegration test.

The table exhibits that time series variables, i.e. Intellectual Property Rights (IPRs), Foreign Direct Investment (FDI), Gross Domestic Product (GDP), Economic Freedom of the World (EFW), Trade Openness (TRADEOP), Population Growth (POPGROWTH), Human Capital (SYR15) and Gross Domestic Investment (GDI), are non-stationary at level and become stationary at I(1).

Table 1

Unit Root Test

Variables	Trace Statistics	Critical Value (5%)	Conclusion
IPR	-8.79	-3.56	I(1)
FDI	-6.61	-2.93	I(1)
GDP	-6.56	-2.93	I(1)
EFW	-3.08	-2.93	I(1)
TRADEOP	-3.38	-2.93	I(1)
POPGROWTH	-5.74	-2.93	I(1)
SYR15	-3.48	-2.96	I(1)
GDI	-2.00	-1.95	I(1)

5.2. Lag Selection Criteria

We started with the lag length of 5 and checked the Akaike Information Criterion (AIC) and Schwarz Criterion (SC). At first instance the AIC suggested for 5 lags which are optimal but the SC is fine with one lag. As we reduce the lag length from the maximum to minimum, we selected the AIC for lag length of 5. At lag length of one the values of both the AIC and SC resemble with each other and give minimum values. To have more significant justifications for the analysis we selected the one lag length criteria.

5.3. Johansen Cointegration Test

The cointegration test confirms the long run relationship among IPR and FDI, GDP, EFW, TRADEOP, POPGROWTH, SYR15 and GDI. The lag length one is chosen which confirm the lowest value for AIC and SC. The summary of the cointegration test is given in the following table:

Table 2

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Maximum Eigenvalue	Trace Statistic	5% Critical Value	Prob.**
None *	0.921885	299.0933	159.5297	0.0000
At most 1 *	0.810957	199.6601	125.6154	0.0000
At most 2 *	0.642494	134.6947	95.75366	0.0000
At most 3 *	0.626583	94.57920	69.81889	0.0002
At most 4 *	0.513516	56.16188	47.85613	0.0068
At most 5	0.329766	28.06037	29.79707	0.0782
At most 6	0.222472	12.45535	15.49471	0.1364
At most 7	0.065490	2.641580	3.841466	0.1041

Trace test indicates 5 cointegrating eqn(s) at the 0.05 level.

*denotes rejection of the hypothesis at the 0.05 level.

**MacKinnon-Haug-Michelis (1999) p-values.

We used both the Eigenvalue and Trace Statistic to determine whether cointegration between variables exists or not. In our summary table there are five cointegrated vectors which are confirmed by the critical value of 5 percent or the P-value of probability. The presence of the cointegration among the variables provides the basis of Vector Error Correction technique.

5.4 . Vector Error Correction Model

The long run relationship between the set of variables normalised with respect to GDP can be written as:

$$\text{GDP} = 121.76\text{IPR} + 0.06\text{FDI} + 33.04\text{EFW} + 0.01\text{TRADEOP} + 131.90\text{PopGrowth} + 22.15\text{SYR15} + 0.004\text{GDI}$$

The analysis clearly depicts that the enforcement of IPR index by one unit would significantly cause to increase the GDP by 121.76 units. Similarly, foreign direct investment, economic freedom of the world and human capital would positively affect the GDP by 0.06, 33.04 and 22.15 units, respectively. Moreover, 1 percent population growth would positively affect GDP by 131.90 units. However, the effects of gross domestic investment and trade openness on GDP are insignificant. The reason may be that the enforcement of IPRs may attract more foreign trade and investment which may consequently erode domestic investment and its impact on economic growth.

Following table presents the full set of adjustment coefficients in the VECM.

Table 3

*Adjustment Coefficients in VECM
(Standard Error in Parentheses)*

D(GDP)	0.028724 (0.01701)
D(IPR)	0.001287 (0.00056)
D(FDI)	5.895342 (1.31742)
D(EFW)	-0.000622 (0.00082)
D(TRADEOP)	0.021149 (0.01144)
D(POPGROWTH)	0.000646 (9.7E-05)
D(SYR15)	-0.000259 (0.00161)
D(GDI)	21.00418 (6.45007)

The results indicate that the short run response of GDP to changes in IPR is also positive and the GDP increases with IPR.

6. CONCLUSIONS AND POLICY RECOMMENDATIONS

The results of our investigation confirm the hypothesis that enforcement of intellectual property rights promotes economic growth in Pakistan. The positive impact of IPRs on growth is confirmed at different levels of economic development.

The need to enforce intellectual property for economic growth arises on many grounds. First, protection of IPRs promotes innovation which consequently enhances productivity and growth. Second, the international demand is increasing for value added products that can be produced through advanced production technology. It means brand names recognition, reputation for quality and product innovation, is playing important role to satisfy this demand. Third, high growth sectors including information and computer technology, entertainment, genetics and biotechnology, support innovation for processed foods, clothing and household products, highly depend on IPRs. Fourth, domestic entrepreneurs acknowledge that their access to frontier technologies depend on the protection of intellectual property rights.

Establishment of intellectual property rights provides both opportunities and challenges. The opportunities are given in the forms of conducive environment for innovation, technology transfer, investment flows, product development and access to global market. On the other hand challenges are given by diverting resources from informal to formal activities, coping with higher costs of imitated products and technologies, and absorbing the costs of IPRs management.

The strong enforcement of IPRs is a necessary but not sufficient condition to achieve the purpose of economic growth. For effective IPRs and economic growth a set of policy measures is required including trade and investment liberalisation, promotion of innovation, commercialisation of technologies, enrichment of human capital for research and development and regulation for effective competition. The real challenge for policy-makers is to transform the static and short run loss of imitation into a dynamic and long run gain of innovation and development through IPRs enforcement.

REFERENCES

- Barro, R. and X. Sala-i-Martin (1995) *Economic Growth*. New York: McGraw Hill.
- Becker, G. (1993) *Human Capital: A Theoretical and Empirical Analysis, with Special Reference to Education*. Chicago: University of Chicago Press.
- Benhabib, Jess and Mark M. Spiegel (1994) The Role of Human Capital in Economic Development: Evidence from Aggregate Cross-country Data. *Journal of Monetary Economics* 34: 2, 143–173.
- Coe, David, and E. Helpman (1993) International R&D Spillover. *European Economic Review* 39, 859–87.
- Easterly, W. and R. Levine (2000) Its Not Factor Accumulation: Stylised Facts and Growth Models. (World Bank Working Paper).
- Falvey, Rod, et al. (2006) Intellectual Property Rights and Economic Growth. *Review of Development Economics* 10:4, 700–719.
- Fink, C. and C. A. Primo Braga (2005) How Stronger Protection of Intellectual Property Rights Affects International Trade Flows. In C. Fink and K. E. Maskus (eds.) *Intellectual Property and Development: Lessons from Recent Economic Research*. Washington, DC: The World Bank/Oxford University Press.
- Ginarte, J. C. and W. G. Park (1997) Determinants of Patent Rights: A Cross-national Study. *Research Policy* 26:3, 283–301.
- Griffith, R. (2000) How Important is Business R&D for Economic Growth and Should the Government Subsidise It? *Briefing Note No. 12*. London: Institute for Fiscal Studies
- Gwartney, J., R. Lawson, and J. Hall (2015) Economic Freedom Dataset. Published in *Economic Freedom of the World: 2015 Annual Report*. Publisher: Fraser Institute.
- IP India Annual Report (2009-2010) Government of India, Controller General of Patents, Designs and Trademarks. Ministry of Commerce and Industry (<http://ipindia.nic.in/>)
- IPO Intellectual Property Rights Organisation of Pakistan (2009) *Annual Report 2008-09*. Government of Pakistan, 7–31.
- Janjua, P. Z. and G. Samad (2007) Intellectual Property Rights and Economic Growth: The Case of Middle Income Developing Countries. *The Pakistan Development Review* 46:4, 711–722.
- Javorcik, B. S. (2004) The Composition of Foreign Direct Investment and Protection of Intellectual Property Rights: Evidence from Transition Economies. *European Economic Review* 48, 39–62. *Journal of Economics* 70, 65–94.
- Lucas, R. E. J. (1988) On the Mechanics of Economic Development. *Journal of Monetary Economics* 22, 3–42.

- Mansfield, Edwin and Jeong Yeon Lee (1996) Intellectual Property Protection and U.S. Foreign Direct Investment. *The Review of Economics and Statistics* 78:2, 181–186.
- Maskus, Keith E. and Carsten Fink (2005) *Intellectual Property and Development*. The World Bank, Oxford University Press.
- Nair-Reichert, Usha and Rod Duncan (2002) Multinational Activities: Do Patent Regimes and Host Country Policies Matter? Georgia Institute of Technology, School of Economics. (Working Paper).
- Rafiqzaman, Mohammed (2002) The Impact of Patent Rights on International Trade: Evidence from Canada. *The Canadian Journal of Economics* 35:2, 307–330.
- Rapp, Richard T. and Richard P. Rozek (1990) Benefits and Costs of Intellectual Property Protection in Developing Countries. *Journal of World Trade* 24:5, 75–102.
- Romer, P. (1986) Increasing Returns and Long Run Growth. *Journal of Political Economy* 94, 1002–1037.
- Sattar, A. and T. Mahmood (2011) Intellectual Property Rights and Economic Growth: Evidence from High, Middle and Low Income Countries. *Pakistan Economic and Social Review* 49:2, 163–186.
- Seyoum, Belay (1996) The Impact of Intellectual Property Rights on Foreign Direct Investment. *The Columbia Journal of World Business* 131:1, 50–59.
- Soete, L. L. G. (1981) A General Test of Technological Gap Trade Theory. *Review of World Economics* 117:4, 639–660.
- Solow, R. M. (1956) A Contribution to the Theory of Economic Growth, World Intellectual Property Organisation (2003). Guide on Surveying the Economic Contribution of the Copyright-Based Industries. (WIPO Publication No. 893 (E), Geneva, WIPO.
- WIPO World Intellectual Property Rights Organisation (2010) National Studies on Assessing the Economic Contribution of the Copyright-Based Industries, Creative Industries Series 5, Economic Contribution of Copyright-Based Industries in Pakistan, 167–220.
- Yang, G. and K. Maskus (1998) Intellectual Property Rights, Licensing and Economic Growth. University of Colorado at Boulder.
- You and Katayama (2005) Intellectual Property Rights Protection and Imitation: An Empirical Examination of Japanese F.D.I. in China. *Pacific Economic Review* 10:4, 591–604.
- Yueh, L. (2007) *Global Intellectual Property Rights and Economic Growth*, *The Northwestern Journal of Technology and Intellectual Property* 5:3, 436–448.
- Zipfel, Jacob (2004) *Determinants of Economic Growth*. Florida State University (Social Sciences-Political Science).

Dictatorships, Patronage and Public Good Provision: Some Empirics

KARIM KHAN and ANWAR SHAH

Dictatorship has been one of the most persistent regimes types in history. Different dictators have applied different strategies for maintaining political support across different societies. We discuss and empirically estimate the hypothesis that states that dictators rely more on patronage as compared to the general provision of public goods for political support. Our results, based on the data from cross-section of the countries from all continents, confirm this hypothesis. We use military spending as an indicator of the patronage to military and the secondary school enrolment as an indicator of the provision of public goods. In the separate sets of regressions, we conclude that dictatorship has a significant negative effect on the secondary school enrolment rate and a significant positive effect on military expenditure as percentage of GDP. These effects, in turn, might have caused the persistent of dictatorships in many societies. In order to generalise these findings, we also check robustness of the findings with respect to other variables like infant mortality rate, average life expectancy, Human Development Index (HDI), corruption, rule of law, ease of doing business and competitiveness. The robustness analysis confirms our findings.

JEL Classification: P16, H11, H41, H42

Keywords: Dictatorship, Patronage, Public Goods Provision, Military Spending, Secondary School Enrolment Rate, Robustness Analysis

1. INTRODUCTION

Dictatorships and their behaviours towards patronage and public goods provision are the topics of debate in various fields like political science, economics, and public choice. In general, dictatorship is defined as “a form of government in which one person or a small group possesses absolute power without effective constitutional limitations”. Historically, it has taken various shapes, and is experienced by almost all of the existent civilisations.¹ However, in all of its instances, it is characterised by the concentration of power in few hands and hence, the existence of a dominant coalition [Magalhaes (1995); Gregor (2001); Olson (1993); North, *et al.* (2009) and Acemoglu and Robinson (2012)].²

Karim Khan <karim.khan@pide.org.pk> is Associate Professor, Pakistan Institute of Development Economics, Islamabad. Anwar Shah <anwar@qau.edu.pk> is Assistant Professor, Quaid-i-Azam University, Islamabad.

¹ For instance, absolute monarchies in the Medieval Europe; the early Muslim identities; communist regimes in Soviet Union, China and North Korea; the present-day monarchies in most of the Arab countries; and the military rulers in the third world countries are the major forms that it has taken in various societies and at various times.

² For instance, North's, *et al.* (2009) characterisation of natural state from Fragile Natural State to Basic Natural State, and from Basic Natural State to Mature Natural State is simply the expansion of a dominant coalition; or in other words, the fraction of people with power in hand increases as natural state develop from fragility to maturity. Similarly, to Acemoglu and Robinson (2012), dictatorship is a set of absolutist and exclusive political institutions from which exclusive economic institutions like limited protection to property rights, limited rule of law, and limited contract enforce mechanism emanate. Thus, the exclusive group dominates in the political, economic and social aspects of life.

The politically dominant coalition also has a privileged position in the economic sphere as the political system is often used to regulate economic competition and create rents. Thus, instead of open access to the wide cross-section of society, dictatorship is associated with limited access order where a dominant coalition dominates the rest of population. The limited access order, in turn, makes dictatorship as an undesirable form of political regimes as compared to constitutional democracy as far as economic development is concerned [Lipset (1959); Drèza and Sen (1989); Olson (1993); Przeworski, *et al.* (2000)].³

However, despite the universal agreement on its undesirability, dictatorship has been persistent throughout the history, and still exists in large parts of the world.⁴ For instance, Deacon (2009) notes that 68 percent of the world's countries are governed by nondemocratic regimes during the last half of the 20th century, and over one-third remained nondemocratic as of 2000. Similarly, with regard to the persistence of military rule, Mulligan, *et al.* (2004) claim that three-fourth of the countries in the world have experienced direct military rule since 1945.⁵ Additionally, the historical analysis illustrates that military has been an important component in the persistence of non-democratic regimes. This reflects that dictatorship encompasses the use of violence in sustaining its political power or the associated economic rents.

In this paper, we concentrate on the undesired effects of dictatorships. In particular, we want to examine whether dictatorships provide patronage to few relative to the provision of public goods to general masses. Patronage is an institution whereby rulers allocate material benefits to a selected group of citizens or agents of the state in return for political support. Though patronage is not specific to a particular regime type; it can exist in any type of regime, depending upon the objectives of the rulers. In the same way, the patronage strategies that the rulers adopt, and the beneficiaries of the resulting patronage strictly depend on the objectives of the ruler. However, in all cases, it has severe implications for the provision of public services. The reason is that dictators rely largely on the provision of excludable goods like patronage or targeted transfers. Hence, the provision of public goods should be significantly poor under dictatorships. We are of the view that patronage, in all cases, has severe implications regarding the quantity and quality of public services for general masses. Qualitative evidence suggests that the quality of public services declines when dictatorship is imposed and improves when dictatorship is replaced [Deacon and Saha (2005)].⁶ For instance, according to Deacon (2009), countries that either lack a legislature or have only a

³According to Olson (1993), the main obstacle to long-run progress in autocracies is that individual rights to property and contracts can never be secure, at least over the long run.

⁴According to North, *et al.* (2009), the rents associated with dictatorship order social relations, control violence, and establish social cooperation within the dominant coalition. These incentives, in turn, make dictatorship advantageous to the members of dominant coalition as compared with other alternatives. Thus, the dominant coalition uses its power to sustain with the status quo in order to maintain its privileges.

⁵Mulligan, *et al.* (2004) further argue that the total number of dictatorships constituted a majority of the world's governments between 1950 and 1991 and comprised over 40 percent at the start of 21st century.

⁶The authors provide various examples. For instance, the authors note that when Nigeria came to under military rule in 1983, the proportion of children staying in school to the fourth grade fell from 81 percent to 72 percent and childhood disease immunisation rates fell by more than one-half. In Argentina, the rural population's access to safe water increased after civilian rule was established in 1973 from 12 percent in 1970 to 26 percent in 1973, but then dropped markedly after the military coup in 1976 to 17 percent in 1984. Greece's infant mortality rate dropped by one-fourth as the country made the transition to democracy during the 1970s.

rubber stamp body enroll only 20 percent of their school age populations in secondary school; countries with effective legislatures enroll 81 percent.

This paper analyses the interaction between the authoritarian regimes, patronage, and the provision of public goods for masses. We particularly, contribute to the literature by combining both the patronage and public goods in the same empirical setting. We want to show that dictators allocate more patronage or targeted transfers relative to democratic rulers. However, they provide a meager amount of public goods, again, relative to democracies. Our measure of patronage is military spending which, if our hypothesis is true, should be higher in dictatorships than in democracies. Second, our measure of public good provision is secondary school enrollment rate which, given our hypothesis, should be significantly and negatively affected by the persistence of dictatorships. Finally, in order to generalise these findings, we do robustness analysis with respect to other variables like infant mortality rate, average life expectancy, Human Development Index (HDI), corruption, rule of law, ease of doing business and competitiveness. The robustness analysis is aimed at providing additional support to our hypothesis. The remaining paper is organised in three sections. Section 2 surveys some of the literature that clarifies the issue discussed in the paper and lays the foundation for the theoretical framework of our analysis. After setting out the theoretical framework, we provide, in Section 3, a detailed analysis of data, empirical results, and discussions in light of the available literature and our empirical results. Section 4 concludes the paper.

2. LITERATURE REVIEW AND THEORETICAL FRAMEWORK

Dictatorship has adverse consequences for a variety of political and economic aspects. In terms of political development, the structure of dictatorship is not consistent with the theoretical aspects of democratic norms; and thus, it has severe implications for the institutionalisation and stabilisation of democratic culture [Ikpe (2000)]. Second, it encourages patronage politics and thereby, enhances the development of clientalist networks [Wintrobe (2000)]. Similarly, in terms of economic development, dictatorship and its associated absolutist economic institutions discourage Schumpeterian creative destruction [North (1990); Wintrobe (2000); Acemoglu, *et al.* (2010); Acemoglu and Robinson (2012)]. The fear of predation by dictators make the innovators and the new entrants shy in investing in research and development and making long term investments, respectively.⁷ In this section, we discuss the literature into two sub-sections that is related mainly to the theme of the paper.

2.1. Dictatorships and Patronage

Patronage and Clientalism are the defining characteristics of Max Weber's broad definition of Patrimonialism.⁸ Patrimonialism is not specific to any particular regime type; however, it is mostly found in dictatorships. Dictators rely on propaganda,

⁷The literature on the economic effects of regime type initiated with the theoretical hypothesis in the seminal work of Lipset (1959). Onwards research analysed various aspects. For instance, Przeworski, *et al.* (2000), based on the data from 35 countries, conclude that per capita income is associated with the types of political regimes. In particular, they conclude that poorest countries are dictatorships. Similarly, Dręza and Sen (1989) argue that all famines have happened under autocratic rule.

⁸ Patrimonialism is a system of personal rule in which the ruler dispenses offices and benefits to subordinates in return for loyalty, support and services. Clientalism is a subset of Patrimonialism that displays patron-client relationships in the exercise of public authority and distribution of benefits.

repression, controlled information, and restricted freedom of speech for their political power. In order to strengthen these instruments, dictators can either resort to the distribution of largesse or to violence. However, in the latter case, they need a specialised force to conduct violence which is often available in the form of military [Magalhaes (1995); Wintrobe (2001, 2012); Acemoglu, *et al.* (2010)]. Thus, in autocratic regimes, the military protect the rule; while, in return, it is endowed with a privileged position in the patronage and rent-seeking activities of political elites [Huntington (1968); O'Donnell (1973); Finer (1976); Levi (1988); McGuire and Olson (1996); Acemoglu, *et al.* (2010)].⁹

The self-interest of military has been extensively discussed in the literature on dictatorships. For instance, according to Nordlinger (1977), the majority of coups are partly or entirely motivated by the defense or enactment of the corporate interests of military. Relatedly, Tullock (1987) argues that dictatorships are usually overthrown by the high-ranking officials within the incumbent government. Regarding the violence capabilities of military, Acemoglu, *et al.* (2010) argue that all non-democratic regimes rely on some degree of repression against the competing groups, and this repression is often exercised by the military. Similarly, Wintrobe (2001) asserts that a rent-seeking military is the cheapest way to solve the 'Dictator's Dilemma'.¹⁰ Thus, in autocracies, control of the armed forces is crucial for capturing and maintaining the apparatus of the government. However, controlling military is costly and the resources spent on it are not available for other purposes.

In the first instance of dictatorships, the military rules directly where it decides about the patronage to itself, and the provision of non-excludable public goods to citizens. Obviously, the special interests of other privileged groups are protected even under the military dictatorships. In case of civilian dictatorships, military serves as an agent of the elite.¹¹ In such arrangements, the civilian dictators determine the size of patronage to the military, the provision of private benefits to the special interest groups, and the provision of non-excludable and non-rival public goods to the citizens. Nevertheless, this allocation crucially depends on the bargaining power of each interest group, and the degree of the rulers' reliance on each of them for political power.¹² In both of these forms, the military provides the

⁹ For instance, in the Medieval European monarchies, royal families had specialised military forces that served their interests. Similarly, in modern dictatorships, the interests of the political elites and the military are generally allied. The logic is simple and is provided with details in Kimenyi (1987) and Mbaku (1991). In democracies, where the legislative bodies generally allocate and oversee the resources assigned to the military, the rent-seeking of military is generally confined to political lobbying. However, in dictatorial regimes, the military face different constraints. Rents are created and allocated by the dictator to groups supporting the ruler [Kimenyi (1987); Mbaku (1991)].

¹⁰ Wintrobe (2001) defines Dictator's Dilemma as "the inability of dictator to know that how much support he has among the general population as well as among smaller groups with the power to depose him. The author further argues that there is always a class of people who are repressed under a dictatorship; and there is also, in any successful dictatorship, another class- the *overpaid*. See also, Wintrobe (2012) for the details.

¹¹ Examples of the military dictatorships include General Ayub Khan, General Muhammad Ziaul-Haq, and General Pervez Musharraf, all the three in Pakistan; the regimes established in Turkey after the coups in 1960, 1971, and 1980; the regime in Guatemala after the coup of 1954 under the leadership Carlos Castillo Armas; the regime in El Salvador in 1956 with the government of Oscar Osorio; the regime in Brazil after the overthrow of President Joao Goulart's government in 1964; and the regime in Greece after the military coup of 1967. Similarly, the examples of civilian dictatorship supported by military include Getulio Vargas established in Brazil in 1937, Ferdinand Marcos's long-lasting regime in the Philippines and President Alberto Fujimori's regime's in Peru.

¹² Mbaku (1991) argues that in authoritarian systems, political success tends to be highly dependent on the use of force and therefore, the groups with comparative advantage in violence dominate in competition for rents. See also Acemoglu, *et al.* (2010).

coercive force needed to maintain the regime security. In particular, the military leaders assure that the competitive interest groups do not develop the modes of behaviour that are detrimental to the state's security. Activities of such competing groups are carefully monitored by the military elites. In return, the military receives rents via a share of government expenditure [Hewitt (1992); Sandler and Harley (1995); Goldsmith (2003)]. Thus, in a sense, this is an exchange relationship. However, to the extent that resources provided to the military are in exchange for some favour to the regime and not for some productive activity, such allocation is a rent or a transfer of income to the military.

2.2. Dictatorships and Public Good Provision

Although, the literature has not fully identified the complete set of priorities of different types of regimes; however, it has consensus on the differences between dictatorships and democracies regarding the provisions of public services [McGuire and Olson (1996); Niskanen (1997); Lake and Baum (2001); Bueno de Mesquita, *et al.* (2003); Deacon (2009)]. For instance, according to McGuire and Olson (1996), dictators maximise and expropriate the budgetary surplus while redistributive democracies maximise the welfare of the elite section of society. Thus, dictators will both charge higher taxes and under-provide public goods. In contrast, democratic rulers have more encompassing interests in the provision of public services. This implies that institutional changes that result in increasing the size of the winning coalition would increase the provision of public goods and decrease the share of government revenue spent on transfers to the politically powerful.¹³ Similarly, Niskanen (1997) quote that democratic rulers maximise the welfare of the median citizen and thereby, provide more public goods than dictators do.¹⁴

According to Lake and Baum (2001), it is the degree of contestability in the political market that matters for the differences in the behaviours of dictators and democratic rulers with regard to policy choices. In democracy, the leader's position is highly contestable relative to dictatorship.¹⁵ The higher degree of competition associated with democracies result in relatively greater levels of public goods and smaller amount of rents to politicians than would

¹³ This idea is equivalent to the expansion in North, *et al.* (2009) dominant coalition and an increased inclusiveness in Acemoglu and Robinson (2012).

¹⁴ The only notable difference between McGuire and Olson (1996) and Niskanen (1997) is that in the former, the democratic rulers maximise the welfare of elite faction while in the later; the democratic rules maximise the welfare of the median citizens, defined in terms of incomes. However, the predictions of both the models are similar. For instance, in both tax rates are lower and public spending higher under democracy than under autocracy. Thus, in both of these models, differences in the policy choices under alternative political systems are driven by differences in the degree to which government represents the interests of broad versus narrow segments of society.

¹⁵ This is because the entry and exit costs to the monopoly position are relatively low in democracies. In contrast, the dictatorship is characterised by high entry and exit costs. For instance, entry might require deposing an all-powerful ruler by force with the possibility of failure. In case of failure, the contender might face exile or even death. Exit by a deposed dictator can be equally costly. We have example of Saddam Hussain in Iraq where the cost for him was death. Similar was the case of Qadafi in Libya. In case of Pakistan, Pervez Musharraf survived but he is ousted from the country. Hosni Mubarak is in prison after the separation from the monopoly position. In addition to the costs to non-democratic rulers, entry and exit may also involve costs to the citizens if the entry or exit takes the form of revolution or civil war etc. The recent revolutions in Egypt, Libya or Syria are living examples of the costs to the citizens. For instance, the strikers in Al-Tahrir square in Egypt not only faced the opportunity costs in terms of foregone earnings; but they also faced several casualties. Similarly, in cases of Libya and Syria, it has taken the form of civil war, involving significant costs to both the supporters of ruling class and the opponents.

be observed under the less competitive dictatorial regimes. In the same way, Bueno de Mesquita, *et al.* (2003) points out that the performance of governments with regard to public good provision, patronage and corruption, the leader's longevity in office, and other matters largely depend on the size of the selectorate and the size of the winning coalition.¹⁶ Second, education and health care systems can be characterised as relatively broadly-based public goods. Thus, investing in the provision of public services such as education and health are the relatively cheap ways of gathering political support for leaders with large winning coalitions, and relatively expensive for leaders with small winning coalitions. Since in democracy, the size of winning coalition is generally larger than that of the dictatorships, so democracies are more prone to the provision of public goods. In contrast, in dictatorship, the size of the winning coalition is small, so targeted transfers and patronage policies are less costly and more effective for political survival.

In all of the three lines of research discussed above, the differences in regime types reflect the size of the privileged group relative to the total population, termed as the system's inclusiveness. In an ideal democracy, the privileged group is the majority of the entire population, while in dictatorship the elite class includes the dictator and his close associates. In a sense, the system's inclusiveness serves the same role as an 'encompassing interest' of the McGuire and Olson (1996), the 'contestability' of Lake and Baum (2001), and the 'winning coalition' of Bueno de Mesquita, *et al.* (2003). This is because all of them argue that since dictators need lesser support relative to representative democrats from the public; therefore, they provide lesser public goods compared to democratic rulers. Our objective in this paper is to provide some empirical evidence to the above debate. First, we examine the nature of relationship between dictatorship and the provision of public goods by using a large set of data. Onwards, we test the patronage hypothesis by using the same data. To our knowledge, this is the first kind of work which combines the two hypotheses by using a larger data set from all continents of the world. In the end, we provide additional support to our hypothesis by checking the robustness of our results through some additional variables of public goods and patronage.

3. DATA, EMPIRICAL RESULTS AND DISCUSSION

In this section, we provide the findings of our analysis. Our major emphasis is on the explanatory power of dictatorship while controlling for a bunch of other possible explanatory variables. In this section, first, we describe the summary sketch of our data. Second, we provide the estimation results and discuss those in case of secondary school enrollment rate. Third, we illustrate the results and discussion of military spending. Finally, we report the results of robustness analysis.

3.1. Data and Summary Statistics

Given the data limitations, we rely on cross-sectional regressions which are based on both annual and averaged data. However, the data is highly variable-specific, depending on

¹⁶ The selectorate includes all individuals who can potentially affect the selection of the government and therefore its policies. The selectorate roughly equates to the electorate in a modern democracy, to Communist party membership in a Soviet style communist state, and to the ruling family in a hereditary monarchy. The winning coalition, a subset of the selectorate, is the set of individuals whose support is necessary for the government to stay in power. In a democracy, a winning coalition must include at least 50 percent of the selectorate, while in a military dictatorship it could be a small cadre of officers.

the availability of data. The use of cross-sectional data is justified by three factors. First, the panel is not balanced, i.e. in some countries; the variables are the averages over long periods but in other cases, they are the averages over small periods. For instance, if a country is either established later or if the data is not available over long period for it; then we use the data for the available smaller periods. Second, the institutional variables are highly persistent. For instance, democracy in developed countries and monarchy in Arab countries are persistent over the whole period covered. Third, Gross Domestic Product (GDP) is endogenous; especially in case of secondary school enrolment rate if we take into account the implications of human capital for economic growth. So, unbalanced panel combined with persistent measure of polity and endogenous GDP would not add much to the analysis as far as the main variable of interest is concerned. The selection of countries is highly random and our sample includes all those for which the variables of our interest are available. The list of countries along with data on their major indicators is given in Table A2 in the Appendix. The data is taken from various sources and considerable care is taken in the construction of variables. Additionally, in Table A4, we provide the details of the definitions of variables and their sources.

For our analysis, we employ two alternative indices of country's regime type. The first one, denoted by dictatorship1, is based on the nation's polity score which is formed by subtracting its autocracy score from its democracy score. It is taken from the Polity *IV* database [Marshall and Jaggers (2000)] which rates countries based on the degree of political competition, the openness and competitiveness of executive recruitment, and the extent of legislative and judicial constraints on the chief executive. The second measure, denoted by dictatorship2, is based on Golder (2005) which measure regime type by a dummy variable where democracy takes a value 0 while dictatorship takes a value of 1. Both of these measures are averaged from 1960 onwards and constructed in such a way that ranges from 0(ideal democracy) to 1(extreme dictatorship). Our dependent variables on public good provision and patronage are secondary school enrolment rate and the military expenditure respectively.

The summary statistics, given in Table 1, show that the average scores on our measures of dictatorships are 0.44 and 0.59 for dictatorship1 and dictatorship2, respectively. This indicates that on average; more than 40 percent of countries in our sample have experienced dictatorship since 1960.¹⁷ The continental-wise division reflects that sub-Saharan Africa leads the world with more than 62 percent of its countries persisted with dictatorship. Sub-Saharan Africa is followed by Asia and then the rest of the countries.¹⁸ Similarly, the countries in Neo-Europe which includes Australia, Canada, New Zealand, and the United States have persisted with ideal democracy. Neo-Europe is followed by main Europe which has very low scores on both measures of dictatorships, reflecting the higher degrees of democracies in most of the European countries.¹⁹

¹⁷ The differences are due to the fact that the second measure is based on just the dummy variable for years in which the countries have experienced dictatorship while the first measure is not based on the years the countries have experienced dictatorship in; instead, it depends upon the characteristics of the selection of chief executives, check and balances on the chief executives and the degree of political competition. However, the correlation between our two measures is 83 percent.

¹⁸ In Asia, we have seen a variety of dictatorships ranging from military dictatorships in countries like Pakistan, Thailand etc. to Arab monarchies and communist dictatorship in China. The rest of the countries mainly include Latin and South American countries.

¹⁹ See for the detailed regional divide of countries Table A3 in the Appendix.

Table 1

Summary Statistics of Variables

Variable	World	Europe	Asia	Sub-Saharan Africa	Neo-Europe	Others
Secondary School Enrolment	55.78 (32.94)	97.7 (9.85)	59.36 (20.97)	21.60 (16.49)	108.80 (26.54)	50.92 (19.88)
Military Expenditure	2.55 (2.45)	1.97 (0.76)	5.15 (4.23)	2.07 (1.19)	2.21 (1.28)	1.66 (1.02)
Dictatorship1	0.44 (0.32)	0.10 (0.18)	0.58 (0.36)	0.62 (0.17)	0 (0)	0.44 (0.26)
Dictatorship2	0.59 (0.42)	0.16 (0.29)	0.71 (0.40)	0.93 (0.10)	0 (0)	0.57 (0.37)
GDP Per Capita	3973 (6925)	7651 (4370)	6695 (12939)	850 (2060)	11592 (4558)	1733 (1624)
Primary School Enrolment	93.5 (21.4)	102.74 (5.53)	96.15 (14.37)	77.88 (27.89)	101.88 (3.55)	98.59 (19.52)
Public Spending on Education	4.14 (1.44)	5.3 (1.2)	3.78 (1.52)	3.55 (1.17)	5.58 (0.56)	3.98 (1.35)
Population (in million)	26.7 (82.5)	20.11 (21.39)	81.53 (172.56)	7.3 (9.4)	52.8 (85.5)	9.25 (14.71)
Openness	54 (40.4)	72 (76.5)	56.99 (31.44)	43.84 (16.22)	36.15 (16.22)	52.14 (26.82)
Area (in thousands square Kilometers)	1050.9 (2024.8)	229 (184.6)	1165.5 (2234.2)	691.21 (538.17)	6955.1 (4574)	995.9 (1638.2)
Aid Per Capita	14.73 (19.01)	3.9 (11.4)	11.92 (26.61)	20.97 (11.25)	0 (0)	19.56 (20.11)
Civil Conflict	0.79 (0.74)	0.17 (0.38)	0.89 (0.74)	1.19 (0.75)	0.25 (0.5)	0.83 (0.65)
External Conflict	0.36 (0.48)	0.17 (0.38)	0.58 (0.51)	0.31 (0.47)	0.5 (0.58)	0.37 (0.49)
Global Effect	2.39 (0.25)	2.38 (0.21)	2.29 (0.21)	2.40 (0.17)	2.63 (0.36)	2.42 (0.31)
Natural Resources Rents	16.13 (13.29)	9.7 (9.8)	19.70 (17.73)	15.68 (11.03)	10.25 (6.29)	18.66 (13.26)
Ethno-Linguistic Fractionalisation	0.29 (0.29)	0.22 (0.28)	0.29 (0.33)	0.30 (0.24)	0.56 (0.43)	0.28 (0.26)
English Common Law	0.31 (0.46)	0.11 (0.32)	0.42 (0.51)	0.42 (0.50)	1 (0)	0.17 (0.38)
Muslim	25.80 (37.74)	1.11 (2.5)	56.45 (43.70)	28.38 (31.05)	0.4 (0.37)	22.36 (39.93)
Urbanisation	48.6 (23.22)	68.34 (12.40)	49.92 (25.12)	27.07 (11.76)	80.3 (5.03)	50.32 (19.52)
Infant Mortality Rate	45.50 (37.09)	37.48 (30.95)	34.19 (31.26)	57.70 (41.24)	27.90 (43.76)	50.24 (37.95)
Average Life Expectancy	66.28 (11.54)	77.52 (2.05)	71.62 (5.12)	50.18 (5.31)	78.44 (1.23)	68.49 (6.54)
Human Development Index	0.64 (0.17)	0.84 (0.04)	0.68 (0.12)	0.43 (0.10)	0.89 (0.01)	0.65 (0.09)
Competitiveness	0.54 (0.23)	0.73 (0.08)	0.63 (0.17)	0.39 (0.22)	0.78 (0.04)	0.48 (0.22)
Ease of Doing Business	0.50 (0.30)	0.86 (0.09)	0.56 (0.25)	0.25 (0.16)	0.95 (0.04)	0.41 (0.22)
Corruption	0.51 (0.22)	0.27 (0.21)	0.58 (0.13)	0.67 (0.16)	0.17 (0.14)	0.53 (0.17)
Law and Order	0.63 (0.26)	0.89 (0.16)	0.70 (0.19)	0.48 (0.22)	1.00 (0.00)	0.52 (0.22)

Note: Each entry is the Average of the variable with Standard Deviation in the Parenthesis. In some cases, the school enrolment goes above 100. However, this is due to the fact this is the proportion of students actually enrolled to a particular age group defined for that education. So this implies, in some cases either over-aged or under-aged students have been enrolled. For the detailed definition of variables see Table A4 in the appendix. See Table A3 in the appendix for the regional divide of countries.

Our indicators of public good provision and patronage show divergent patterns. For instance, the average secondary school enrolment rate is around 21.6 percent in sub-Saharan Africa which is the lowest among all the continents. However, patronage, indicated by higher military expenditure as percentage of GDP, is higher in Asia. Asian countries, on average, spend 5.15 percent of their GDP on military, followed by Neo-Europe with 2.21 percent and sub-Saharan Africa with 2.07 percent. Similarly, the detailed summary statistics of the other control variables are shown in Table 1. Again, we are interested in analysing the behaviour of dictators towards the provision of public goods and patronage allocation. So, we expect the coefficient on our measures of regime type to be negatively significant in case of public goods, and positively significant in case of patronage. Alternatively, dictators are more inclined towards patronage allocation than they are to the provision of public goods. The control variables in both cases are different, depending upon the theoretical predictions in the available literature.

3.2. Secondary School Enrolment Rate

Secondary school enrolment rate is the most widely used measure of public good provision [Lake and Baum (2001); Keefer (2007); Deaton (2009)].²⁰ The primary control variables used in all the specifications of the secondary school enrolment rate are real GDP per capita, primary school enrolment rate, and public spending on education. In order to control for the endogeneity of GDP per capita, we use GDP per capita of the initial available year for each country. In addition, we control for Sub-Saharan Africa in some specifications to ensure that the results are not driven by some special characteristics of these countries. Three different measures, i.e. population, total area and the degree of the openness of a country, are used to control for the scale of the economy. In addition to these, foreign aid per capita is also controlled for in some specifications to see if it has any impact on education as most of the donor agencies claim with regard to education. To control for targeted transfers based on ethnic politics, we also control for ethno-linguistic fractionalisation because ethno-linguistic fractionalisation is strongly correlated with civil conflicts, arising mainly from issues related to distribution.²¹

Table 2 shows the results of our regressions for secondary school enrolment rate, each column including a subset of these control variables. Columns I and II represent baseline regressions for our two measures of dictatorship respectively. As is evident from the table, both of these measures have a significant negative impact on secondary school enrolment rate. Column I shows that a 1 percent transition from dictatorship to democracy results in an approximately 0.38 percent increase in the secondary school enrolment rate. Alternatively, a 1 percent increase in secondary school enrolment rate could be achieved through an approximately 2.5 percent transition from dictatorship to democracy. This translates to the fact that countries that are successful in comprehensive transition from extreme dictatorship to ideal democracy have 37.7 percent greater secondary school enrolment rate relative to those countries that persisted with extreme dictatorships. Similarly, Column II, using the second measure of dictatorship, shows that the difference between extreme dictatorship and ideal democracy in terms of secondary

²⁰ The selection of our possible control variables is mainly based on this literature.

²¹ Montalvo and Reynal-Querol (2005) has shown that ethnic diversity affects the incidence of civil wars arising mainly from issues related to the distribution of common pool in ethnically diverse societies.

Table 2

OLS Regressions for Secondary School Enrollment Rate

Dependent Variable: Secondary School Enrollment Rate

Explanatory Variables	I	II	III	IV	V	VI	VII	VIII	IX	X
constant	-10.33 (9.26)	-11.85 (10.48)	5.23 (9.26)	-2.48 (11.26)	0.56 (8.58)	5.19 (9.30)	5.31 (9.32)	5.16 (9.23)	6.70 (9.12)	14.75 (11.80)
Dictatorship1	-37.73*** (6.68)		-32.33*** (5.83)		-27.65*** (5.44)	-32.33*** (5.86)	-32.33*** (5.86)	-32.40*** (5.76)	-30.54*** (5.57)	-31.79*** (6.90)
Dictatorship2		-29.07*** (5.30)		-22.93*** (5.06)						
GDP Per Capita	0.001*** (0.0003)	0.001*** (0.0003)	0.001*** (0.0003)	0.001*** (0.0003)	0.0006** (0.0002)	0.001*** (0.0003)	0.001*** (0.0003)	0.001*** (0.0003)	0.001*** (0.0003)	0.001*** (0.0005)
Primary School Enrollment	0.54*** (0.086)	0.55*** (0.099)	0.42*** (0.081)	0.46*** (0.098)	0.26*** (0.07)	0.42*** (0.083)	0.42*** (0.082)	0.41*** (0.082)	0.41*** (0.08)	0.42*** (0.098)
Public Spending on Education	(6.45)*** (1.38)	6.94*** (1.23)	6.04*** (1.24)	6.77*** (1.17)	5.05*** (1.15)	6.05*** (1.26)	6.07*** (1.26)	6.05*** (1.23)	6.60*** (1.17)	3.99** (1.55)
Sub-Saharan Africa			-19.44*** (4.19)	-15.97*** (4.38)	-13.56*** (3.98)	-19.41*** (4.27)	-19.46*** (4.19)	-19.13*** (4.24)	-18.24*** (4.13)	-19.77*** (5.40)
Urbanisation					0.48*** (0.13)					
Population						1.02e-09 (2.17e-08)				
Openness							-0.004 (0.045)			
Area								8.60e-07 (1.11e-06)		
Per Capita Foreign Aid									-0.20 (0.19)	
Ethno-Linguistic Fractionalisation										-6.54 (7.14)
R ²	0.72	0.73	0.77	0.76	0.82	0.77	0.77	0.78	0.79	0.78
F-Statistic	98.12***	113.33***	87.11***	89.10***	90.35***	72.35***	71.66***	80.70***	80.85***	57.54***
N	96	96	96	96	96	96	96	96	96	73

Note: * Significant at 10 percent; ** Significant at 5 percent; *** Significant at 1 percent. Robust Standard Errors in the Parenthesis. There are no significant differences between estimation with dictatorship1 and dictatorship2; therefore we use dictatorship1 in all the sensitivity specifications.

school rate is around 29 percent. Columns III and IV add the dummy for sub-Saharan Countries to Columns I and II respectively to show the effects of the characteristics of these countries. In both cases, the measures of dictatorships are still significant. Dictatorships have 32 percent and 23 percent lesser secondary school enrolment rates than democracies in the two cases respectively.

To do the sensitivity analysis, from Column IV onwards, we control for additional factors like the degree of urbanisation, population, the degree of openness of a country, the total area of a country, per capita aid received by a country, and the ethno-linguistic fractionalisation in a country. Additionally, since there is no significant difference between the results of our two measures of dictatorship, therefore we report all the remaining specifications with our first measure of dictatorship. As is evident from the table, all of the scale variables like population, area and openness are insignificant, implying that the scale of economies does not change the magnitude and significance of our main results. Urbanisation is significant but still the difference between extreme dictatorship and ideal democracy remains at around 28 percent in terms of secondary school enrollment rate. Finally, ethno-linguistic fragmentation also does not have any significant effect on our results like the scale variables. Thus, our sensitivity analysis indicates that the significance of our main variable of concern, i.e. dictatorship is robust.

After the initial results, it is always essential to see that the results are robust to the problems of reverse causality and endogeneity. For instance it is possible that higher education levels caused by increases in secondary school enrollment rate subsequently results in institutional improvements, i.e. it cause transition from authoritarianism to democracy. To explore this, we adopt the approach of instrumental variables. We use legal origins and Muslim denomination as instruments for our measures of dictatorships. Legal origins are regarded as colonial legacy, and are the most commonly used instruments for institutional quality [Hall and Jones (1999); Acemoglu and Johnson (2005); Keefer (2007); Kerekes and Williamson (2008)]. To our knowledge, we are the first to use the Muslim beliefs as instrument for dictatorship. Since the spread of Islam, Muslim rulers have attracted that the earth belongs to the God and they rule as God's deputy or lieutenant on this earth [Crone (2003)]. Thus, Muslim beliefs have an associated legitimacy for the persistence of dictatorships. This is evidenced by the fact that majority of the countries where the percentage of Muslim population is higher have experienced dictatorships. Among them are Pakistan, Nigeria, Saudi Arabia, Iraq, Iran, and other Arab countries where majority of the population are Muslims. Second, we believe that Muslim beliefs might not have a direct effect on current policy choices with respect to secondary school enrollment rate.²² For instance, Islam does not have any distinctive view regarding the spread of education as compared with other religions.

Similarly, colonial history reflects the institutional origins of a country. The idea that many countries have distinct legal origins is identified by La Porta, *et al.* (1999) and Glaeser and Shleifer (2002). Legal origin is shown to shape institutions because different legal traditions, imposed during colonisation, affect current legal systems [Djankov, *et al.* (2003)]. They are classified as common law and civil law systems. Common law, imposed during British colonisation, is referred to as English legal origin. The French imposed civil law systems. Thus, the British Common Law and the French Civil Law would be good

²² The Muslim Denomination is measured as the percentage of Muslims into total population.

instruments for the development of subsequent political institutions in the colonised countries. We use British common law as one of our instruments to control for the impact of legal origins on current institutions. This approach circumvents the problem of endogeneity, i.e., the Muslim denomination and legal origins determine current political institutions, but not current policy choices or outcomes. Similarly, current policy outcomes such as secondary school enrolment cannot determine legal origins 150 to 200 years ago or Muslim denomination.

The instruments need to be valid, i.e. only affect the dependent variable indirectly through their effects on the endogenous variables. To ensure the validity of instruments, we use Sargan's test for the over-identifying restrictions and Hausman's test for the comparison of OLS coefficients with 2SLS coefficients. The detailed results of these tests, summarised in Table A1 in the appendix, show that in all our regressions, the instruments are valid.²³ Thus, all of the instruments influence the institutional development of countries, but neither is plausibly related to policy choices regarding secondary school enrolment rate in the 1960s onwards. The results of our 2SLS analysis are given in Table 3. The results indicate that our original results did not suffer from the significant problems of reverse causality or endogeneity. The signs and significance of

Table 3

2SLS Regressions for Secondary School Enrollment

Dependent Variable: Secondary School Enrollment Rate

Explanatory Variables	I	II	III	IV	V
constant	-28.62** (13.28)	-23.73 (14.40)	2.33 (12.69)	-0.79 (13.64)	3.73 (10.20)
Dictatorship1	-27.44** (9.60)		-29.10*** (8.89)		-31.18*** (7.58)
Dictatorship2		-20.07** (8.30)		-24.74*** (7.97)	
GDP Per Capita	0.002*** (0.0004)	0.001*** (0.0003)	0.001*** (0.0003)	0.001*** (0.0003)	0.0006*** (0.0002)
Primary School Enrollment	0.59*** (0.10)	0.58*** (0.11)	0.43*** (0.09)	0.46*** (0.10)	0.26*** (0.074)
Public Spending on Education	(7.77)*** (1.47)	7.68*** (1.36)	6.26*** (1.22)	6.65*** (1.16)	4.84*** (1.15)
Sub-Saharan Africa			-19.92*** (4.08)	-15.32*** (4.55)	-13.22*** (3.88)
Urbanisation					0.46*** (0.13)
Adjusted-R ²	0.69	0.71	0.76	0.75	0.80
F-Statistic	86.47***	99.26***	85.21***	89.35***	91.01***
No. of Observation	96	96	96	96	96

Note: * Significant at 10 percent; ** Significant at 5 percent; *** Significant at 1 percent. Robust Standard Errors in the Parenthesis. In 2SLS, the R^2 has no statistical meaning and therefore is omitted from the table. For 2SLS, the appropriate test for the validity of the instrument is the Sargan test statistic which has the null hypothesis that instrument are not correlated with the error term of the second stage and therefore that the excluded instrument are correctly excluded from the regression. Failure to reject the null implies that the instruments are valid. For all of our specifications: For the Sargan test statistic P-Value >0.05, which implies the validity of instruments. Similar comparing the OLS coefficients with those of 2SLS: For Hausman t-statistic, P-Value>0.05, which implies no significance difference between OLS and 2SLS estimates. For the details of the tests values, see Table A1 in the appendix. We report 2SLS results only for those specification in which all the coefficients in case of OLS are significant.

²³See the note of Table 3 for the details of tests regarding the instruments. The detailed results of these tests are given in Table A1 in the Appendix.

the main variables like the degree of authoritarianism and all the other relevant controls remain unchanged. The only notable difference is that the coefficients on the dictatorship became a little bit different as they are expected in case of 2SLS. However, for all the specifications, the Hausman's P-values are larger than 0.05. So, we conclude that there are no large differences between the OLS estimates and the 2SLS estimates, and consequently, the OLS coefficients are consistent. However, we report the results of 2SLS for completeness.

3.3. Military Spending as Percentage of GDP

Many proxies have been used to measure patronage in economies. The most notable of these are the size of public sector measured as public expenditure as percentage of GDP, the government wage bill, or the size of public investment etc.²⁴ However, these measures are subject to some criticism. First, the size of the public sector includes both spending on public services and special-interest spending, so we cannot separate the impact of regime type on patronage. The same is true with the government wage bill. Second, most of these proxies are useful when used for estimating the effects of various types of democracies or the quality of democracies on public budgets.²⁵ Since, in this study, our purpose is to see the impact of dictatorship on patronage and public good provision, we believe that the military spending is preferable to other proxies of patronage or targeted transfers. Our belief is legitimised by two different but related justifications. First, dictators are not interested in voting or re-election; instead, they are interested in enhancing or maintaining their political power because most of their rents are associated with that power.²⁶ Second, they need a specialised force to control their potential opponents or to dodge the threats to their regimes. The military is endowed with two capabilities in dictatorial regimes: first, they can overthrow the dictator; second, they can control his opponents by using their specialisation in violence. Due to these proficiencies, dictators are highly dependent on military, and therefore are more inclined to offer the military more than their best available alternatives.

With regard to the military spending, the existing literature has not fully identified a congruent theory which is also supported by empirics [Rosh (1988); Collier and Hoeffler (2007); Albalade, *et al.* (2012)]. The main difficulty is that many factors need to be taken into consideration while analysing military spending. In this study, by avoiding parsimony, we test for a bunch of control variables along with our main variable of concern, i.e. regime type. In political science, it has been often argued that rulers use military spending to keep their militaries from overthrowing them [Nordlinger (1977); Leon (2010)]. In this study we test this hypothesis empirically in case of dictatorship. Alternatively, we want to comprehend how much the dictators incentivise the military to persist with their power or sustain their rule. This issue is important in the sense that higher rents to the military reduce the resources available for the provision of other public

²⁴ Keefer (2007) used both the government wage bill and public investment.

²⁵ For instance, it is useful when we compare the spending patterns of presidential and parliamentary democracies.

²⁶ In democracies, the rulers are interested in maximising their votes, and therefore they focus more on private interest groups, rather than public interest groups like bureaucracy, judiciary, or the military.

goods [Sprout and Sprout (1968)]. This section is completely devoted to the empirical analysis of military spending with special emphasis on dictatorships. The dependent variable throughout is the military spending as percentage of GDP.

The results of ordinary least squares estimation is summarised in Table 4. In the first two columns, we just regress military spending on per capita GDP and our two measures of dictatorships respectively. Both of our proxies for dictatorships have a significant positive effect on military spending as is expected. For instance, in case of dictatorship1, extreme dictatorial regimes spend 0.88 percent of GDP more on military than ideal democracies do. In other words, transition from extreme form of dictatorship to ideal democracy reduces military spending by 0.88 percent of GDP. In the same way, our second measure, i.e. dictatorship2, indicates that military spending is higher in absolute dictatorships by 0.51 percent of GDP relative to ideal democracies. In addition, both of these columns have significant and positive coefficients on per capita GDP along with significant F-statistics for the overall regressions.

In Columns III and IV we control for civil conflicts, external conflicts, and the size of population for our two measures of dictatorships respectively. In both of these specifications, the civil conflicts and population affect military spending positively, but both are insignificant. Similarly, external conflict has positive coefficients but is insignificant in specification in which we use our first measure of dictatorship (Column III); however, it is significant at 10 percent in column IV which use our second measure of dictatorship. In both of these specifications, the significance of our main variables of concern, i.e. dictatorships, remains intact. Again, since there is no significance difference between our two measures of dictatorships as far as estimation is concerned; so, in all of our sensitivity analysis, we report only specifications with our first measure of dictatorship which is based on data from polity IV.

In Columns V and VI, we control for two additional scale variables, i.e. the total area and the degree of openness respectively. In both cases, we have no significant effect of these variables on the inclination to spend on military. Column VII is aimed at controlling for demonstration effect or global effect. In a sense, this is a proxy for arms race. However, it has no significant effect on military spending. Columns VIII and IX control for the windfall rents variables, i.e. foreign aid and natural resources wealth, respectively. The results show that both of the windfall variables have no significant effects on military spending. Additionally, Columns X, XI, XII control for Africa, Europe, and Asia respectively. The only significant continent is Asia where there are majority of dictatorships in our sample. Also, this is consistent with the fact that on average, Asian countries spend more on military as compared with other countries.²⁷ Overall, in these results, three points are very important to be noted. First, in all of these specifications, ranging from III to XII, dictatorships and per capita GDP have a significant positive effect on military spending. Second, almost in all specifications, civil as well as external conflicts are insignificant. Also, the geographical variable like area, or social variable like population has no significant effect in the decisions to spend on military. These three points together indicate that the demand factors have no motives for higher military spending; instead the income and patronage effects are stronger.

²⁷ See, for instance, the summary statistics.

Table 4

OLS Regressions for Military Expenditure

Dependent Variable: Log (Military Expenditure as % of GDP)

Explanatory Variables	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
constant	-0.68 (0.51)	-0.53 (0.59)	-1.27 (1.14)	-0.83 (1.18)	-1.36 (1.07)	-3.16* (1.75)	-1.07 (1.36)	-1.82 (1.28)	-2.01 (1.75)	-0.97 (1.20)	-1.08 (1.17)	-0.71 (1.11)
Dictatorship1	0.88*** (0.30)		0.80** (0.35)		0.68** (0.32)	0.90*** (0.35)	0.81*** (0.36)	0.84*** (0.32)	0.77** (0.38)	0.84** (0.37)	0.85** (0.37)	0.58** (0.29)
Dictatorship2		0.51** (0.18)		0.48** (0.16)								
Log (GDP Per Capita)	0.13** (0.06)	0.12** (0.05)	0.17*** (0.06)	0.16** (0.07)	0.16*** (0.06)	0.18*** (0.06)	0.17*** (0.06)	0.19*** (0.07)	0.17*** (0.06)	0.15** (0.07)	0.15** (0.07)	0.16*** (0.06)
Civil Conflict			0.14 (0.11)	0.15 (0.11)	0.11 (0.12)	0.19* (0.12)	0.14 (0.11)	0.13 (0.10)	0.15 (0.12)	0.17 (0.13)	0.15 (0.11)	0.15 (0.10)
External Conflict			0.25 (0.17)	0.31* (0.16)	0.26 (0.18)	0.22 (0.17)	0.26 (0.16)	0.25 (0.17)	0.21 (0.17)	0.23 (0.19)	0.27 (0.17)	0.13 (0.15)
Log (Population)			0.01 (0.05)	0.01 (0.05)	-0.04 (0.07)	0.06 (0.06)	0.01 (0.05)	0.03 (0.05)	0.04 (0.08)	0.001 (0.05)	0.001 (0.05)	-0.02 (0.05)
Log (Area)					0.08 (0.08)							
Log (Openness)						0.27 (0.21)						
Log Global Effect							-0.30 (0.88)					
Aid Per Capita								0.004 (0.004)				
Log (Natural Resources Rents)									0.10 (.17)			
Africa										-0.18 (0.24)		
Europe											0.18 (0.17)	
Asia												0.66*** (0.20)
R ²	0.12	0.10	0.17	0.13	0.19	0.19	0.18	0.20	0.18	0.18	0.18	0.27
F-Statistic	4.30**	4.06**	3.28***	3.26***	3.24***	3.32***	3.30***	3.17***	3.26***	3.04***	3.06***	4.84***
N	95	95	95	95	95	94	95	95	94	95	95	95

Note: * Significant at 10 percent; ** Significant at 5 percent; *** Significant at 1 percent. Robust Standard Errors in the Parenthesis. There are no significant differences between estimation with dictatorship1 and dictatorship2; therefore we use dictatorship1 in all the sensitivity specifications.

Again, in this case also, we need to check the robustness to the problems of reverse causality and endogeneity. For instance, the persistence of modern military dictatorships in the third world countries might have caused by the excessive military spending in the past.²⁸ Even in case of civilian dictatorships, it might be the case that the excessive spending on military might cause the persistence of dictatorships, provided that these spending are higher in dictatorships relative to democracy. To take into account such possibilities, we provide Two Stages Least Squares (2SLS) estimates in Table 5. Again, the instruments that we use for our measures of dictatorships include legal origin of English Common Law and the religious belief of Muslim denomination. As mentioned earlier, the English Common law is the most frequently used instrument for political institutions.²⁹ Also, in this case, we add an additional instrument in the form of Muslim religious denomination as the percentage of Muslim population in countries is highly correlated with our both measures of dictatorships. Our instruments satisfy the Sargan test for over-identifying restrictions, implying the validity of our instruments. Similarly, the Hausman test regarding the differences between OLS and 2SLS estimators suggests no significant differences between the two set of estimators in all the specifications that we provide in Table 5. The estimates and their standard errors are larger as are expected in case of the 2SLS, but our results do not suffer from the severe problems of reverse causality or endogeneity. Again, for completeness, we report 2SLS estimates.

Table 5

<i>2SLS Regressions for Military Expenditure</i>					
Dependent Variable: Log (Military Expenditure as % of GDP)					
Explanatory Variables	I	II	III	IV	V
constant	-1.44** (0.67)	-2.26** (0.90)	-2.62* (1.53)	-3.97** (1.90)	-1.28 (1.45)
Dictatorship1	1.55*** (0.52)		1.43*** (0.55)		0.84** (0.41)
Dictatorship2		1.55*** (0.56)		1.49** (0.67)	
Log (GDP Per Capita)	0.20*** (0.07)	0.28*** (0.09)	0.22*** (0.08)	0.30*** (0.09)	0.18*** (0.07)
Civil Conflict			0.09 (0.13)	0.04 (0.15)	0.13 (0.11)
External Conflict			0.17 (0.18)	0.20 (0.20)	0.11 (0.15)
Log (Population)			0.06 (0.06)	0.10 (0.08)	0.001 (0.06)
Asia					0.62*** (0.20)
Adjusted-R ²	0.10	0.06	0.11	0.12	0.21
F-Statistic	6.55***	5.96***	3.48***	3.39***	4.40***
N	95	95	95	95	95

Note: * Significant at 10 percent; ** Significant at 5 percent; *** Significant at 1 percent. Robust Standard Errors in the Parenthesis. In 2SLS, the R^2 has no statistical meaning and therefore is omitted from the table. For all of our specifications: For the Sargan test statistic P-Value >0.05, which implies the validity of instruments. Similar comparing the OLS coefficients with those of 2SLS: For Hausman t-statistic, P-Value >0.05 for all cases, which implies no significance difference between OLS and 2SLS estimates in these cases. For the details of the tests values, see table A1 in the appendix. We report 2SLS results only for those specification in which some of the coefficients are significant in case of OLS along with baseline regressions.

²⁸In countries like Pakistan and Nigeria, the excessive spending on military, legitimised by the conflicts with India and ethnic conflicts respectively, has made the military's incentives larger to remain in the government.

²⁹See for instance Hall and Jones (1999), Acemoglu, *et al.* (2005) and Keefer (2007).

3.4. Generalisation of the Results

As stated earlier, our objective in this study is to combine the relationships of dictatorship with public goods and patronage and give some generalised results in this regard. In order to substantiate the results in the previous sections, we check the robustness with regard to other measures of public goods and patronage. We take three other measures of public goods, i.e. infant mortality rates, average life expectancy and Human Development Index (HDI).³⁰ All of the three reflect the public sector provision of the social services or public goods. Likewise, we use four other measures which can reflect both the provision of public goods and patronage-related activities. These measures include law and order, corruption, ease of doing business and competitiveness.³¹ For instance, if the state is based on Weberian principles, then there would be transparent law and order, less occurrence of corruption and the private sector would enjoy the ease of doing business and competitiveness. However, if the government resorts to patronage for political support, then we would have poor law and order, more corruption, and more barriers to businesses and competition. Alternatively, when political leaders engage in nepotism (hiring close associates) and cronyism (awarding non-competitive government contracts to friends and relatives), they would violate rule of law. Likewise, when government rewards groups, families, ethnicities through licensing, monopoly rights or government contracts, it results in corruption, rent-seeking and kick-backs. Thus, all of the patronage type activities restrict entry to businesses and discourage competition. In order to draw some proposition regarding these claims, we do the robustness analysis with regard to these variables. The corresponding results are shown in Table 6.

As is visible from Table 6, infant mortality rates decline by around 25 infants per 1000 infants with the complete transition from extreme dictatorship to ideal democracy. Likewise, average life expectancy in extreme dictatorship is around 10 years lower as compared to the ideal democracy. Similar is the case with HDI, i.e. HDI increases by 16 percent with the complete transition from dictatorship to democracy. The results with respect to the law and order show that the strength and impartiality of the legal system or observance of the rule of law is lower in dictatorships by around 29 percent as compared to democracies. Likewise, dictatorships are around 6 percent more corrupt as compared to the ideal democracies. Alternatively, corruption in the form of excessive patronage, nepotism, job reservations, 'favour-for-favours', secret party funding, and suspiciously close ties between politics and business is highly prevalent in dictatorships. The index of ease of doing business shows the relative easiness in indicators like construction permits, registration, getting credit, tax payment mechanism etc. Our results show that these indicators are relatively easier in democracies by around 32 percent. Finally, the Global Competitiveness Index (GCI) integrates the microeconomic and the macroeconomic aspects of competitiveness into a single index. It assesses the factors, policies and institutions, based on 12 pillars of competitiveness, which are essential for long-term growth and prosperity. Our results with respect to the competitiveness indicate that transition from extreme dictatorship to ideal democracy enhances the average competitiveness of countries by 42 percent.

³⁰ See Table A4 in the appendix for the precise definition of these variables.

³¹ Again, see Table A4 for the definition of these variables.

Table 6

Robustness with Other Measures of Public Goods and Patronage

Dependent Variable: Secondary School Enrolment Rate

Explanatory Variables	Life			Ease of Doing			
	Infant Mortality	Expectancy	HDI	Law and Order	Corruption	Business	Competitiveness
constant	31.89** (13.26)	56.98*** (4.44)	0.58*** (0.06)	0.65*** (0.14)	0.058*** (0.13)	0.68*** (0.15)	0.65*** (0.18)
Dictatorship1	24.83** (11.72)	-9.80** (4.61)	-0.16** (0.077)	-0.29** (0.14)	0.064** (0.023)	-0.32** (0.14)	-0.42** (0.19)
GDP Per Capita	-0.00067*** (0.0002)	0.0004*** (0.0001)	0.00006*** (0.00002)	0.00001** (0.000004)	-0.00001** (0.000004)	0.0007* (0.00037)	0.00026* (0.00014)
Public Spending on Health	-2.22** (1.13)	0.80** (0.36)					
Sub-Saharan Africa	2.33** (1.11)	-16.82*** (2.16)	-0.12*** (0.027)	0.02*** (0.005)	0.09** (0.03)	-0.09** (0.04)	-0.04*** (0.005)
Urbanisation	0.30* (0.16)	0.13*** (0.04)	0.003*** (0.0005)	0.007*** (0.0003)	-0.001** (0.0004)	0.68*** (0.16)	0.001** (0.00055)
Adjusted-R ²	0.60	0.74	0.78	0.67	0.66	0.52	0.55
F-Statistic	73.23***	77.99***	96.47***	63.67***	63.22***	54.95***	49.35***
No. of Observation	96	96	96	96	96	96	96

Note: * Significant at 10 percent; ** Significant at 5 percent; *** Significant at 1 percent. Robust Standard Errors in the Parenthesis. In 2SLS, the R^2 has no statistical meaning and therefore is omitted from the table. For 2SLS, the appropriate test for the validity of the instrument is the Sargan test statistic which has the null hypothesis that instrument are not correlated with the error term of the second stage and therefore that the excluded instrument are correctly excluded from the regression. Failure to reject the null implies that the instruments are valid. For all of our specifications: For the Sargan test statistic P-Value >0.05, which implies the validity of instruments. Similar comparing the OLS coefficients with those of 2SLS: For Hausman t-statistic, P-Value>0.05, which implies no significance difference between OLS and 2SLS estimates. For the details of the tests values, see table A1 in the appendix. We report 2SLS results only for those specification in which all the coefficients in case of OLS are significant.

4. CONCLUSION

This study is motivated by the recent literature that emphasises the importance of institutions for economic development. The literature has, so far, arrived at the conclusion that absolutist political institutions create absolutist economic institutions which, in turn, are associated with limited access order. In such a limited access order, the wide-cross section of society is deprived of the access to general services like education or health on the one hand and on the other hand, lessor or no protection is provided to their property rights. Consequently, the countries which have persisted with absolutist political institutions are facing the problem of under-development. Given this premise, there is a growing theoretical debate about the inclination of dictators to spend more on military to sustain and prolong their regimes; and to spend less on the provision of public services in its place. In this study, we have endeavoured to draw some conclusions empirically about this debate by testing this hypothesis empirically.

We have carried out three separate estimations in this regard. First, we estimate the secondary school enrolment rate as an indicator of public services provision. Second, we analyse military spending as an indicator of patronage. Third, in order to substantiate our results, we use other measures of public good provision and patronage. In all of the cases, the emphasis is on the type of regime in the list of all possible explanatory variables. The results, based on data from the cross-section of the countries, confirm the hypothesis, i.e. dictatorship has a significant negative effect on public good provision and

a significant positive effect on the patronage. Hence, we conclude that dictators tend to rely more on patronage to the targeted groups for political support instead of relying on the wide cross-section of the society.

Although, the study clearly demonstrates the behaviour of dictators towards the provision of public goods, and the patronage, we believe that more future research is needed to draw some general propositions for policy recommendations regarding institutional reforms in the third world countries. For instance, we have taken a very narrow approach by indexing the dictators' behaviour towards patronage with military expenditure. Future work may develop an index for patronage that can capture the effects of targeted transfers both to the private interest groups as well as to the state's privileged groups like military, bureaucracy, and the judiciary. In addition, more econometric analysis is clearly needed in order to understand the exact channels of causation. Likewise, one must be careful before generalising the findings of the paper. The reason is that once dictators become stronger; they could start investing on public goods for winning general support. In addition, it is quite possible that continuous spending on military prevails in order to thwart any unexpected revolt from the people.

APPENDIX

Table A1

Results of the Sargan Test for Over-identifying Restrictions and Hausman Specification Test

Secondary School Enrolment Rate				
Specification	Sargan Results		Hausman Results	
	Sargan Chi-Square Values	P-values	Hausman t-Values	P-values
I	2.88	0.578	1.49244	0.139
II	2.208	0.698	1.409005	0.162
III	1.536	0.909	0.481269	0.631
IV	1.056	0.958	-0.29394	0.769
V	0.0192	0.999	-0.66875	0.505
Military Expenditure				
Specification	Sargan Results		Hausman Results	
	Sargan Chi-Square Values	P-values	Hausman t-values	P-values
I	3.686	0.158	1.577453	0.118
II	2.375	0.305	1.961217	0.053
III	4.218	0.518	1.484924	0.141
IV	3.23	0.666	1.552377	0.124
V	1.5675	0.955	0.897085	0.372
Robustness Analysis				
Specification	Sargan Results		Hausman Results	
	Sargan Chi-Square Values	P-values	Hausman t-values	P-values
Infant Mortality Rate	2.536	0.122	1.639467	0.105
Life Expectancy	3.750	0.130	1.261285	0.210
HDI	3.144	0.618	1.384076	0.170
Corruption	4.133	0.456	1.442365	0.153
Law and Order	3.735	0.895	0.953358	0.343
Ease of Doing Business	1.743	0.784	1.537021	0.128
Competitiveness	3.875	0.352	1.367232	0.175

Table A2

List of the Countries with Main Variables

Country	SSE	ME	DIC1	DIC2	Country	SSE	ME	DIC1	DIC2
Algeria	47.46	2.90	0.79	1.00	Libya	65.54	2.55	0.85	1.00
Angola	12.68	6.00	0.75	1.00	Madagascar	20.62	1.18	0.49	0.80
Argentina	69.05	1.15	0.40	0.33	Malaysia	55.09	2.35	0.27	1.00
Australia	148.46	1.99	0.00	0.00	Mali	12.37	2.18	0.59	0.78
Austria	98.56	1.03	0.00	0.00	Mauritania	16.76	3.36	0.81	1.00
Bangladesh	29.00	1.26	0.48	0.67	Mexico	57.36	0.53	0.52	0.98
Belgium	108.30	1.55	0.01	0.00	Morocco	32.34	3.76	0.87	1.00
Bolivia	64.06	2.10	0.37	0.64	Mozambique	8.06	1.75	0.59	1.00
Botswana	41.20	3.40	0.16	1.00	Oman	36.81	12.99	0.97	1.00
Brazil	69.75	1.60	0.41	0.27	Netherlands	110.20	1.86	0.00	0.00
Bulgaria	93.16	2.81	0.53	0.80	New Zealand	97.09	1.32	0.00	0.00
Cameroon	21.66	1.37	0.81	1.00	Nicaragua	40.41	1.59	0.51	0.69
Canada	97.41	1.45	0.00	0.00	Niger	5.67	1.03	0.65	0.93
Central African Republic	10.96	1.34	0.68	0.80	Nigeria	21.32	0.79	0.56	0.71
Sri Lanka	64.91	3.60	0.20	0.23	Norway	103.02	2.16	0.00	0.00
Chad	9.55	2.61	0.78	1.00	Pakistan	21.16	5.14	0.47	0.48
Chile	73.48	3.64	0.35	0.31	Panama	61.65	1.34	0.42	0.45
China	52.89	2.05	0.87	1.00	Papua New Guinea	11.01	0.96	0.30	0.00
Colombia	55.84	2.98	0.12	0.16	Paraguay	38.92	1.09	0.59	1.00
Congo, Democratic Republic	21.76	1.52	0.86	1.00	Peru	65.81	1.40	0.36	0.58
Costa Rica	51.96		0.00	0.02	Poland	89.03	2.09	0.51	0.78
Denmark	113.02	1.65	0.00	0.00	Portugal	77.98	2.12	0.27	0.55
Dominican Republic	47.99	0.61	0.29	1.00	Qatar	76.30	3.07	1.00	1.00
Ecuador	52.40	2.19	0.29	0.33	Saudi Arabia	80.60	10.80	1.00	1.00
El Salvador	43.59	1.13	0.33	0.69	Senegal	15.51	1.64	0.55	1.00
Ethiopia	15.80	3.75	0.75	1.00	Sierra Leone	15.06	2.28	0.60	0.73
Finland	109.93	1.48	0.00	0.00	Vietnam	50.35	3.53	0.85	1.00
France	97.12	2.85	0.10	0.00	South Africa	85.40	2.18	0.21	0.87
Gabon	36.11	1.58	0.83	1.00	Zimbabwe	28.05	4.12	0.57	1.00
Gambia	19.37	0.80	0.35	1.00	Spain	97.98	1.36	0.26	0.56
Germany	101.28	1.68	0.00	0.00	Sudan	20.23	2.77	0.72	0.80
Ghana	40.67	0.61	0.59	0.91	Sweden	104.02	1.97	0.00	0.00
Greece	87.71	3.87	0.18	0.13	Switzerland	95.77	1.23	0.00	0.00
Guatemala	26.73	0.86	0.42	0.20	Syria	50.10	6.01	0.90	1.00
Guinea	18.82	1.93	0.80	1.00	Togo	24.32	2.55	0.76	1.00
Guyana	84.69	1.05	0.46	0.74	Trinidad and Tobago	73.53	0.43	0.06	0.00
Haiti	15.72	0.09	0.74	0.87	United Arab Emirates	63.29	7.81	0.90	1.00
Honduras	29.85	0.63	0.33	0.53	Tunisia	49.92	1.78	0.82	1.00
India	39.73	2.86	0.07	0.00	Turkey	50.36	3.38	0.16	0.33
Indonesia	44.57	1.37	0.68	0.96	Uganda	11.85	2.54	0.66	0.87
Iran	61.76	2.58	0.81	1.00	Egypt	56.27		0.80	1.00
Ireland	99.77	0.86	0.00	0.00	United Kingdom	90.32	2.91	0.00	0.00
Israel	87.23	9.54	0.03	0.00	Tanzania	6.36	1.43	0.72	1.00
Italy	81.39	1.94	0.00	0.00	United States	92.25	4.08	0.00	0.00
Jamaica	69.14	0.60	0.02	0.00	Burkina Faso	6.79	1.39	0.71	1.00
Japan	96.27	0.96	0.00	0.00	Uruguay	78.78	1.86	0.25	0.22
Kenya	34.52	1.81	0.63	1.00	Venezuela	57.21	1.51	0.12	0.20
Korea, South	84.96	3.03	0.43	0.74	Zambia	17.00	2.09	0.59	0.73
Kuwait	82.38	15.56	0.91	1.00					

Note: SSE is the School Enrollment Rate, ME is the Military Expenditure as % of GDP, DIC1 is our first measure of dictatorship, denoted by Dictatorship1, and DIC2 is the Dictatorship2 used in study. For the detailed of the definitions of variables See Table A4 in the appendix.

Table A3

Regional Divide of Countries

Regions	No. of Countries	List of Countries
Europe	18	Austria, Belgium, Bulgaria, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, Norway, Poland, Portugal, Spain, Sweden, Switzerland, United Kingdom
Asia	19	Bangladesh, Sri Lanka, China, India, Indonesia, Iran, Israel, Japan, Kuwait, Malaysia, Oman, Pakistan, Qatar, Saudi Arabia, Vietnam, Syria, Turkey, South Korea, UAE
Sub-Saharan Africa	26	Angola, Botswana, Cameroon, Central African Republic, Chad, Congo Democratic Republic, Ethiopia, Gabon, Gambia, Ghana, Guinea, Kenya, Madagascar, Mozambique, Niger, Nigeria, Senegal, Sierra Leone, South Africa, Zimbabwe, Togo, Uganda, Tanzania, Burkina Faso, Zambia, Mali
Neo-Europe	4	Australia, Canada, New Zealand, United States of America
Others	30	Algeria, Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Dominican Republic, Ecuador, El Salvador, Guatemala, Guyana, Haiti, Honduras, Jamaica, Libya, Mauritania, Mexico, Morocco, Nicaragua, Panama, Papua New Guinea, Paraguay, Peru, Sudan, Trinidad and Tobago, Uruguay, Venezuela, Tunisia, Egypt

Table A4

Summary of the Definitions and Sources of Variables (Part I)

Variable	Definition	Source
Secondary School Enrollmet	Gross Secondary School Enrollment Rate. It is the proportion, regardless of age, to the population of the age group that officially corresponds to the level of education shown, averaged from 1960 to 2010.	World Development Indicators, World Bank
Military Expenditure	Military Expenditure are taken as Percentage of GDP, averaged from 1960 to 2009.	World Development Indicators, World Bank
Dictatorship1	Polity IV project data on Polity=democracy-autocracy. It is constructed such that it ranges from 1(Extreme Dictatorship) to 0(Ideal democracy), averaged from 1964-2009, depending upon availability.	Polity IV, (Marshall and Jaggers, 2000)
Dictatorship2	This indicator is based on regime type by a dummy variable where democracy takes a value 0 while dictatorship takes a value of 1 in a Particular year. It is averaged from 1960 to 2000, so that it becomes an index ranging from 1(Extreme Dictatorship) to 0(Ideal Democracy)	The data on Yearly regime type is taken from Golder (2005)
GDP Per Capita	This is taken as the GDP per capita of the initial available year for a country and is taken in terms of constant 2000 \$.	World Development Indicators, World Bank
Primary School Enrollment	Gross Primary School Enrollment Rate. It is the proportion, regardless of age, to the population of the age group that officially corresponds to the level of education shown, averaged from 1960 to 2010	World Development Indicators, World Bank
Public Spending on Education	Total Public spending on education, as Percentage of GDP, averaged from 1960 to 2010.	World Development Indicators, World Bank

Continued—

Table A4—(Continued)

Population	This is taken as the total population of the initial available year for a country from 1960 onwards.	World Development Indicators, World Bank
Openness	It is measured as the sum of imports and exports of goods and services as percentage of GDP. It is averaged from 1960 to 2010.	World Development Indicators, World Bank
Area	Total Area in Square Kilometers	World Development Indicators, World Bank
Aid Per Capita	Total aid Received by a Country. It represents Official Development Assistance (ODA) and other official aid received in constant US dollars, taken as average from 1960 to 2010	World Development Indicators, World Bank
Civil Conflict	This is the sum of Two Dummies. One dummy takes the value of 1, if at least one internal conflict has taken place and it is not intervened by other countries since in 1960 and 0 otherwise. The other takes the value of 1, if at least one internal conflict has taken place and it is intervened by the government of other states. So our measure takes three values, <i>i.e.</i> 0, 1 or 2.	PRIO (Peace Research Institute of Oslo http://www.prio.no r/)
External Conflict	This denotes the conflict between two or more countries. It takes the value 1 if at least one conflict has taken place since 1960, 0 otherwise.	PRIO (Peace Research Institute of Oslo http://www.prio.no r/)
Global Effect	For a given country, this is the average of the military expenditure as Percentage of GDP of the rest of the World. This is calculated from the data used in this study.	Calculated From Data on Military Expenditure Self-Calculated
Asia, Europe and Africa	Dummies, takes the value of 1 if a country belongs to a particular Continent, 0 otherwise.	
Natural Resources Rents	It is measured as the per cent share of natural resources exports (including agricultural and raw material exports, fuel exports, food exports, and ores and metals exports) in GDP, averaged from 1960 to 2000.	World Development Indicators, World Bank
Ethno- Linguistic Fractionali- sation	. It is the probability that the two randomly selected individuals from a given country will not belong to the same ethno-linguistic group. The greater probability implies more ethno-linguistically diverse society.	Easterly and Levine (1997)
English Common Law	It takes a value of 1 if the country's legal origin is based on British common law and 0 otherwise.	La Porta et al. (1999).
Muslim	The percentage of population in a country belonging to Islam in 1999. La Porta, <i>et al.</i> calculated these values for 1999.	La Porta et al. (1999).
Urbanisation	Average of urban population as percentage of total population from 1960 to 2010.	World Development Indicators, World Bank

Note: GDP per capita is taken for the initial available year in order to take into account the implications of human capital for economic growth and thereby, avoid the endogeneity of GDP. Similarly, in most of the applied microeconomic studies, it is shown that more educated people raise fewer children. Therefore, to avoid the endogeneity of population, we take the population of the initial year for each country.

Table A4

Summary of the Definitions and Sources of Variables (Part II)

Variable	Definition	Source
Infant Mortality Rates	It measures the number of infants dying before reaching one year of age, per 1000 live births in a given year	World Development Indicators (WDI), World Bank
Average Life Expectancy	Life expectancy at birth indicates the number of years a newborn infant would live if prevailing patterns of mortality at the time of its birth were to stay the same throughout its life.	World Development Indicators (WDI), World Bank
Human Development Index (HDI)	It is the geometric mean of three indexes, i.e. the Life Expectancy Index, the Education Index and the Income Index. These component indexes are based on life expectancy at birth, mean years of schooling, expected years of schooling, and gross national income per capita. $\text{Life Expectancy Index (LEI)} = \frac{LE-20}{85-20}$ $\text{Education Index (EI)} = \frac{MYSI - EYSI}{2}$ $\text{Mean Years of Schooling Index (MYSI)} = \frac{MYS}{15}$ $\text{Expected Years of Schooling Index (EYSI)} = \frac{EYS}{15}$ $\text{Income Index (II)} = \frac{\ln(GNIPC) - \ln(100)}{\ln(75,000) - \ln(100)}$ $\text{Human Development Index (HDI)} = \sqrt[3]{LEI * EI * II}$	Human Development Report published by UNDP
Law and Order	Law and order show the strength and impartiality of the legal system. It also shows an assessment of popular observance of the law.	The International Country Risk Guide (ICRG), the PRS group.
Corruption	It shows corruption in the form of excessive patronage, nepotism, job reservations, 'favor-for-favors', secret party funding, and suspiciously close ties between politics and business.	The International Country Risk Guide (ICRG), the PRS group.
Ease of Doing Business	The Ease of doing business is an index shows different parameters which define the ease of doing business in a country. It includes indicators like construction permits, registration, getting credit, tax payment mechanism etc.	The World Bank
Competitiveness	The Global Competitiveness Index (GCI) integrates the microeconomic and the macroeconomic aspects of competitiveness into a single index.	The World Economic Forum (WEF)

REFERENCES

- Acemoglu, D. and J. Robinson (2012) *Why Nations Fail: The Origins of Power, Prosperity and Poverty*. New York: Crown Business.
- Acemoglu, D. and J. Robinson (2000) Why Did the West Extend the Franchise? Democracy, Inequality, and Growth in Historical Perspective. *The Quarterly Journal of Economics* 115:4, 1167–1199.
- Acemoglu, D., T. Davide, and A. Vindigni (2010) A Theory of Military Dictatorships. *American Economic Journal: Macroeconomics* 2:1, 1–42.
- Albalade, D., G. Bel, and F. Elias (2012) Institutional Determinants of Military Spending. *Journal of Comparative Economics* 40:2, 279–290.

- Bueno de Mesquita, B., J. D. Morrow, R. M. Siverson, and A. Smith (2003) *The Logic of Political Survival*. Cambridge: The MIT Press.
- Collier, P. and A. Hoeffler (2007) Unintended Consequences: Does Aid Promote Arms Races? *Oxford Bulletin of Economics and Statistics* 69:1, 1–27.
- Crone, P. (2003) *God's Caliph: Religious Authority in the First Centuries of Islam*. Cambridge: Cambridge University Press.
- Deacon, R. T. (2009) Public Good Provision under Dictatorship and Democracy. *Public Choice* 139:2, 241–262.
- Deacon, R. T. and S. Saha (2005) Public Good Provision by Dictatorship: A Survey. University of California. (Santa Barbara Working Paper).
- Djankov, S., R. La Porta, F. Lopez-de-Silanes, and A. Shleifer (2003) Courts. *Quarterly Journal of Economics* 118:2, 453–517.
- Drèze, J. and A. Sen (1989) *Hunger and Public Action*. Oxford: Oxford University Press.
- Easterly, W. and R. Levine (1997) Africa's Growth Strategy: Policies and Ethnic Divisions. *Quarterly Journal of Economics* 112:4, 1230–1250.
- Finer, S. E. (1976) *The Man on Horseback: The Role of the Military in Politics*. Piscataway, NJ: Transaction Publishers.
- Glaeser, E. and A. Shleifer (2002) Legal Origins. *Quarterly Journal of Economics* 117:4, 1193–1229.
- Golder, M. (2005) Democratic Electoral Systems around the World. *Electoral Studies* 24, 103–121.
- Goldsmith, B. E. (2003) Bearing the Defense Burden, 1886-1989: Why Spend More? *Journal of Conflict Resolution* 47:5, 551–573.
- Gregor, A. J. (2001) Dictatorship: Abstract. In Neil J. Smelser and Paul B. Baltes (eds.) *International Encyclopedia of the Social and Behavioral Sciences*. Oxford: Elsevier Science.
- Hall, R. E. and C. I. Jones (1999) Why do Some Countries Produce so Much More Output per Worker than Others? *The Quarterly Journal of Economics* 114:1, 83–116.
- Hewitt, D. (1992) Military Expenditure Worldwide: Determinants and Trends, 1972-1988. *Journal of Public Policy* 12:1, 105–152.
- Huntington, S. (1968) *Political Order in Changing Societies*. New Haven: Yale University Press.
- Ikpe, U. B. (2000) Partimonialism and Military Regimes in Nigeria. *African Journal of Political Science* 5:1, 146–162.
- Jones, B. D., R. B. Frank, C. Breunig, C. Wlezien, S. Soroka, M. Foucault, A. Francois, G. Pedersen, C. Koski, P. John, P. B. Mortensen, F. Varone, and W. Stefaan (2009) A General Empirical Law of Public Budgets: A Comparative Analysis. *American Journal of Political Science* 53:4, 855–873.
- Keefer, P. (2007) Clientalism, Credibility and the Policy Choices of Young Democracies. *American Journal of Political Science* 51:4, 804–821.
- Kerekes, C. B. and C. R. Williamson (2008) Unveiling De Soto's Mystery: Property Rights, Capital Formation and Development. *Journal of Institutional Economics* 4:3, 299–325.
- Kimenyi, M. S. (1987) Bureaucratic Rents and Political Institutions. *Journal of Public Finance and Public Choice* 3:1, 189–199.

- Kimenyi, M. S. and J. M. Mbaku (1995) Rents, Military Elites and Political Democracy. *European Journal of Political Economy* 11:3, 699–708.
- La Porta, R., F. Lopez-de-Silanes, A. Shleifer, and R. Vishny (1999) The Quality of Government. *Journal of Law, Economics and Organisation* 15:1, 222–279.
- Lake, D. A. and M. A. Baum (2001) The Invisible Hand of Democracy: Political Control and the Provision of Public Services. *Comparative Political Studies* 34:6, 587–621.
- Leon, G. (2010) *The Economic Causes of Coups*. Cambridge University. (Mimeographed).
- Levi, M. (1988) *Of Rule and Revenue*. Berkeley: University of California Press.
- Lipset, S. M. (1959) Some Social Requisites of Democracy: Economic Development and Political Legitimacy. *American Political Science Review* 53:1, 69–105.
- Magalhaes III, E. (1995) Dictatorships. In *Survey of Social Science: Government and Politics Series*. Volume 2, Salem Press.
- Marshall, M. G. and K. Jagers (2000) *Polity IV Project: Political Regime Characteristics and Transitions, 1800–1999*. College Park: Center for International Development and Conflict Management, University of Maryland.
- Mbaku, J. M. (1991) Military Expenditure and Bureaucratic Competition for Rents. *Public Choice* 71:1, 19–31.
- McGuire, M. C. and M. Olson (1996) The Economics of Autocracy and Majority Rule: The Invisible Hand and the Use of Force. *Journal of Economic Literature* 34:1, 72–96.
- Montalvo, J. G. and R. Reynal-Querol (2005) Ethnic Polarisation, Potential Conflict, and Civil Wars. *American Economic Review* 95:3, 796–816.
- Mulligan, C. B., R. Gil, and X. Sala-I-Martin (2004) Do Democracies have Different Public Policies than Non-democracies? *Journal of Economic Perspectives* 18:1, 51–74.
- Niskanen, W. A. (1997) Autocratic, Democratic and Optimal Government. *Economic Inquiry* 35, 464–479.
- Nordlinger, E. A. (1977) *Soldiers in Politics: Military Coups and Governments*. NJ: Prentice-Hall Englewood Cliffs.
- North, D. C. (1990) *Institutions, Institutional Change and Economic Performance*. Cambridge: Cambridge University Press.
- North, D. C., J. J. Wallis, and B. R. Weingast (2009) *Violence and Social Orders: A Conceptual Framework for Recorded Human History*. Cambridge: Cambridge University Press.
- O'Donnell, G. (1973) *Modernisation and Bureaucratic-Authoritarianism: Studies in South American Politics*. Berkeley, CA: Institute of International Studies.
- Olson, M. (1993) Dictatorship, Democracy, and Development. *The American Political Science Review* 87:3, 567–576.
- Olson, M. (1965) *The Logic of Collective Action: Public Goods and the Theory of Groups*. Cambridge: Harvard University Press.
- Przeworski, A., M. E. Alvarez, J. A. Cheibub, and F. Limongi (2000) *Democracy and Development: Political Institutions and Well-being in the World, 1950-1990*. New York: Cambridge University Press.
- Robinson, J. (2000) When is a State Predatory? Unpublished Manuscript, University of California, Berkeley.

- Rosh, R. M. (1988) Third World Militarisation. Security Webs and the States they Ensnare. *Journal of Conflict Resolution* 32:4, 671–698.
- Sandler, T. and K. Hartley (1995) *The Economics of Defence*. New York: Cambridge University Press.
- Sprout, H. and M. Sprout (1968) The Dilemma of Rising Demands and Insufficient Resources. *World Politics* 20:4, 660–693.
- Tullock G. (1987) *Autocracy*. Boston, M.A: Kluwer Academic Publishers.
- Wintrobe, R. (2000) *The Political Economy of Dictatorship*. Cambridge: Cambridge University Press.
- Wintrobe, R. (2001) How to Understand, and Deal with Dictatorship: An Economist's View. *Economics of Governance* 2:1, 35–58.
- Wintrobe, R. (2012) Autocracy and Coups D'état. *Public Choice* 152:1, 115–130.

Volatility Modelling and Dynamic Linkages between Pakistani and Leading Foreign Stock Markets: A Multivariate GARCH Analysis

GHULAM GHOUSE, SAUD AHMED KHAN, and MUHAMMAD ARSHAD

It is essential for financial institutions and academicians to understand volatility spillover and financial market returns. However, previous studies examined the effects of direct spillover only and ignored those of the newly emerging stock markets. Therefore, this study attempts to estimate the time-varying volatility of Pakistani and leading foreign stock markets. It also tries to explore the direct and indirect volatility spillover effect between Pakistani and eight leading foreign stock markets. Daily data were used from nine international equity markets (KSE 100, NIKKEI 225, HIS, S&P 500, NASDAQ 100, DOW JONES, GADSI, FTSE 350 and DFMGI) for the period between 2005 and 2016. The univariate GARCH and GJR models were employed for analysing volatility, and the multivariate GARCH Diagonal BEKK model was used to explore direct and indirect volatility spillover effects. In order to analyse the volatility spillover effect during and after the global financial crisis period, the data were categorised into two periods: between 2005 and 2009 and between 2010 and 2016. The Chow break-point test was also employed to identify structural breaks in return series due to global financial crises. Direct and indirect spillover effects were found between KSE100, S&P 500, NASDAQ 100, DOW JONES and DFMGI.

Keywords: Volatility, Spillover, Equity Market, Financial Crisis and GARCH

1. INTRODUCTION

Globalisation has led to great changes in the global business including easy capital flow, the growth of technology, financial associations among the economies, and markets integration. However, the integration of markets extends the effects of financial crises, which means a crisis in one market affects other markets around the world. Therefore, financial institutes, portfolio managers, and market players should understand the volatility modelling and make an analysis of linkages among different financial markets. The global financial crisis stands as a perfect opportunity to quantify the magnitude of interdependence among the global financial markets. The objective of this study is to conduct an investigation to describe the direct and indirect spillover effects among the Pakistani and leading foreign financial markets.

Ghulam Ghouse <Ghouserazaa786@gmail.com> is PhD Scholar, Pakistan Institute of Development Economics, Islamabad. Saud Ahmed Khan <saudak2k3@yahoo.com> is Assistant Professor, Pakistan Institute of Development Economics, Islamabad. Muhammad Arshad <Wakeupnation786@gmail.com> is Lecturer, Government Commerce College, Faisalabad.

The severe financial crisis took place in the US in 2008 not only caused imbalances in the US economy but also affected the global economy. The main reasons for this crisis were imperfections in the international financial planning, an exceptionally relaxed monetary policy, accumulation of imbalances in the global balance of payment, and regulatory breakdowns at micro-prudential and macro-prudential levels [Kawai, *et al.* (2012)]. Generally, global financial crises begin in the US, and owing to the strong linkages between the US economy and global economies, the effects of these crises reach all integrated economies.

The effects of the 2008 global financial crisis directly transferred to the Pakistani economy through capital flow, exports, equity values and remittances [Amjad and Din (2010)]. The Pakistani economy at that time was also suffering from some domestic social and economic problems, such as energy shortage, political instability, the deficit in the current account, growing unemployment, bad governance and inefficient macroeconomic policies [Ghose and Khan (2017)]. Accordingly, the Pakistani economy encountered a shortfall in balance of payment, a reduction in exports volume and stagflation. Nazir, *et al.* (2012) stated that financial institutions in Pakistan, especially the commercial banks, were directly affected by the 2008 financial crisis, which also significantly compressed their market policies, working strategies, and financial arrangements. However, the Islamic banking system was less affected than the conventional banking system [Phulpoto, *et al.* (2012)].

Pakistan stock exchange (KSE 100 index) closed at its highest points 14,814.85 on 26 Dec. 2007 with accumulated market assets of Rs 457 trillion. The accumulated stock market capitalisation was only Rs.1.85 trillion (\$23 billion) with points 5,865.01 on 31 Dec. 2008. A more critical situation arose on 23 Jan. 2009, when the stock market index had only pointed 4,929.54 with a total market capitalisation of Rs 1.58 trillion [Amjad and Din (2010)]. It indicates the loss of approximately 65 percent from the highest point of 26 Dec. 2007. In 2006-07, the foreign direct investment in PSX listed companies was \$500 million, which was reduced due to the global financial crisis (for further detail see SBP, 2006-07 and 2008-09).

Dubai economy also suffered from the effects of the US mortgage crisis 2008 (hereafter global financial crisis) due to its investment linkages with the US economy and the international financial system [Onour (2010)]. The real estate was one of the most prominent sectors of Dubai in 2007-08. The real estate sector contributed more than 23 percent to the GDP of Dubai economy in 2007-08, which was badly affected by the global financial crisis. Dubai property sharply slumped due to the global recession; home prices were declined 50 percent from their peak in 2008. In the real estate sector, the government of Dubai hampered \$59 billion liabilities, and the total debt became \$80 billion in a few weeks [Gabbatt (2009)]. Dubai banking sector was stuck in this vicious circle of financial crisis, limited capital reserves and the regulation imposed on bank lending. The investment in the real estate sector was reduced due to the shortage of loaning from the banks.

The financial sector of Dubai contributed 11 percent to the GDP in 2008, while exports and other trade contributed 31 percent to the GDP. Because of the global financial crisis, the oil prices dropped significantly from \$140 to \$50 from June 2008 to March 2009 in the international market, which curtailed the volume of trade [Ellaboudy (2010)]. Dubai

financial market also impressively affected Dubai economic growth. Dubai financial market was also crashed by the global financial crisis as the portfolio investment declined from 42 percent to 18 percent in the crisis period, which resulted in a debt crisis (known as Dubai financial crisis 2009). In June 2008, the Dubai stock market fell down; 57 companies were listed on the Dubai financial market (DFM) with an accumulated market capitalisation of about \$360 billion in 2007 [Gabbatt (2009)]. Dubai financial market index (DFMGI) closing price was found \$5489.37 on Nov. 13, 2007, while on 31 Jan. 2008, Dubai financial market index (DFMGI) closing price was recorded \$5615.95. Also, on 21 Dec. 2008, (DFMGI) closing price was found only \$1793.26.

Pakistan has a significant economic relationship with Dubai. Dubai is one of the emerging markets in the United Arab Emirates (UAE) where over 1.2 million Pakistani emigrants are providing their services. Their remittances significantly contribute to Pakistan's foreign reserve, which makes the UAE the second prominent source of remittances to Pakistan. For example, Pakistan expatriates provided \$2.52 billion remittances in 2013-14 with a share of 19.57 percent in total remittances. Similarly, the UAE has a major share in Pakistan exports and imports [PES (2010)].

In 2006-08, a lot of money moved from Pakistan and many other countries to Dubai where property and capital markets were flourishing. At that time, credit was available at low cost, and traders were operating the market to gain large dividends. These people did not know what would be the result of this easy money. During the UAE cityscape "7th annual property and real estate exhibition 2008" in Dubai, more than 100 Pakistani, out of 40,000 visitors from all over the world, invested over \$100 million in the booking of construction projects. Within the 10 to 11 months after Nov. 3, 2007, the outflow of capital from Pakistan economy to Dubai was estimated to be between \$30 billion and \$45 billion [Aziz (2008)]. A huge amount of new money arrived in Dubai and a large ratio of it wiped out when Dubai capital and the property market crashed.

The above discussion elaborates the financial linkages between Pakistan, US, and Dubai economies. In this study, the stock markets of those countries are considered, which are interlinked with the Pakistan economy and the global economic and financial system. Although Pakistan economy is not very much linked with the international financial system, it could be affected through indirect channels which have not been explored in any previous study especially in context of Pakistan, US, and Dubai stock markets.

The main objective of this study is to measure the degree of direct and indirect volatility spillover effects of other leading foreign stock markets on Pakistan stock exchange. To explore the spillover effects among leading stock markets in crisis and after the crisis period, data from the period between 2005 and 2016 is used. To see the magnitude of volatility spillover effect during and after the crisis, data was split into two parts, from 2005 to 2009 and post-crisis period ranging between 2010 and 2016. The findings of the study are helpful in device short run and long economic policies during and after crises.

2. LITERATURE REVIEW

This section briefly discusses previous studies. Kawai, *et al.* (2012) found that global markets experienced a huge wave of financial crisis due to the United State sub-

prime mortgage crisis. This crisis affected not only the US domestic economy but also other economies of the world, which were integrated directly or indirectly with the US economy. Mishkin (2011) indicated that this crisis started from a small segment of the financial system, but in 2008-2009, it became a reason for the global financial crisis.

Jawed (2015) investigated co-movements between S&P 500 and KSE 100 and found a significant spillover effect from the S&P 500 to KSE 100. Ahmed, *et al.* (2018) explored the mean and volatility spillover effect between stock indices of five developed and seven developing stock markets and concluded that there is a spillover effect from NIKKIE 225 to KSE 100. Jebran, *et al.* (2017) explored the spillover effect amongst emerging markets of Asia. They found that there is a bi-directional volatility spillover effect among Pakistan, India, and Sri Lanka stock markets. Zia-ur-Rehman, *et al.* (2011) found that the global financial crisis's negative effect was transmitted to the Pakistan stock market. Aziz and Iqbal (2017) explored the spillover effect among the USA, India, Japan, and Pakistan stock markets. He found a volatility spillover effect between Pakistani, USA, and Japan stock markets. Jan and Jebran (2015) investigated the volatility spillover effect from USA, Germany, France, and UK stock markets to Pakistan stock market. They found a significant volatility spillover effect from G5 stock markets to KSE 100 in the global financial crisis. The volatility spillover effect was transmitted to Pakistan from international stock markets due to the regional connectivity [Wahid and Mumtaz (2018)]. Draz (2011) examined that Pakistan economy faced five financial crises (1958, 1974, 1979, 1997 and 2008); four out of them significantly affected the Pakistan economy. Li and Giles (2015) measured the spillover effect from US stock markets to Japan and other six Asian developing countries stock markets. They found a unidirectional return and volatility spillover from the US to other markets.

Iqbal and Sattar (2010) found that the global crisis was also a cause for dipping remittances, fewer exports, stock markets decay, the flight of capital, and local currencies depreciation. They also concluded that the global crisis critically affected foreign direct investment, exports, and portfolio investment. During the financial crisis, Pakistan needed financial inflows in different shapes from other countries to improve economic growth. Financial inflow to the developing countries decreased by approximately US\$300 billion. Investors shifted Portfolio investment and foreign direct investment to those countries that were not affected by the global financial crisis [Cali, *et al.* (2008)].

Kharchenko and Tzvetkov (2013) examined the volatility spillover effect between developing and developed market economies and found that there is a spillover effect between the USA and European stock markets. Angkinand, *et al.* (2009) investigated how the financial crisis in US markets impacted 17 developed economies, and they found that spillover effects from the US to other industrial countries were highest after the collapse of the U.S subprime mortgage market in 2007. Fraser and Oyefeso (2001) explained the significant dynamic links of United State stock markets with the UK and European stock markets.

Ghose and Khan (2017) examined the spillover effect between Dubai financial market and S&P 500, DOW JONES, and NASDAQ indices. They found a significant bidirectional spillover effect between Dubai financial market and USA stock markets. Alsukker (2010) explored that the US mortgage crisis 2008 affected Dubai financial market, the banking system, economy, and Dubai's companies credit ratings. Onour

(2017) stated that the spillover effect of the US Mortgage crisis 2008 badly affected oil-producing countries including Dubai. The portfolio investment in the financial market of Dubai decreased by 42 percent. Due to this spillover effect, Dubai also faced an internal debt crisis in 2009. Hasan (2010) found that the financial crisis crushed the major sector of the economy. The Global financial crisis barely affected Dubai among all the other oil-producing countries leading to reducing the oil prices in the developed countries. Ellaboudy (2010) indicated that from mid-2008 to March 2009, oil prices dropped down from \$140 to \$50 at the international market.

All the studies reviewed in this section examined direct channels of the volatility of spillover effect from leading foreign stock markets. There is no single study exploring the indirect channel of volatility spillover effect between Pakistani and foreign leading stock markets. Also, the relation between Pakistan and Dubai stock markets has not been significantly explored. To fill these gaps at first, the magnitude of direct volatility spillover effect between Pakistani and foreign stock markets was re-estimated. Secondly, the indirect volatility spillover effect between Pakistani and foreign stock markets was estimated. Lastly, the volatility spillover effect between Pakistani and Dubai financial market was estimated.

3. ECONOMETRIC METHODOLOGY AND MODEL SPECIFICATION

To capture the time-varying conditional variance phenomenon, Engle (1982) proposed the Autoregressive Conditional Heteroscedastic (ARCH) model. Although the ARCH model is a considerable contribution to the econometric literature, it has some problems including long lag length and non-negativity restriction on parameters. To solve the first problem, Bollerslev (1986) introduced generalised autoregressive conditional heteroscedastic (GARCH) model, which improves the unique specification with the addition of the lag value of conditional variance, which acts as a smoothing term. The GARCH model cannot analyse asymmetric and leverage effects. For this, Glosten, Jagannathan, and Runkle (1993) proposed a GJR model. GJR model is a significant extension of the standard GARCH model. It contains an asymmetric term in conditional variance equation. To avoid any non-convergence problem in this study, an appropriate univariate GARCH type model such as GARCH (p, q) and GJR (p, q) is employed to estimate volatility models, and the multivariate DGARCH-BEKK is employed to explore volatility spillover effect.

The financial series at a level are trendy in nature [Ghouse and Khan (2017)]. It is impossible to estimate a robust model if the series is trendy. To deal with the trend, the log return is used.

$$R_t = \log_e(l_t/l_{t-1})$$

l_t = Financial time series at level i.e. stock indices and exchange rates at the end of time t .

l_{t-1} = First lag of financial time series.

3.1. Modelling for Volatility

3.1.1. GARCH (p, q) Model

Bollerslev (1986) proposed a generalised extension of ARCH (q) model Generalised autoregressive conditional heteroscedastic (GARCH) model.

The general description of the GARCH model is

Conditional Mean Equation

$$R_t = \alpha_0 + \beta X_t + \varepsilon_t \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad (3.1)$$

Where $\varepsilon_t = z_t \sigma_t, \quad z_t \sim N(0,1)$

Conditional Variance Equation

$$\sigma_t^2 = \theta_0 + \sum_{i=1}^q \theta_i \varepsilon_{t-i}^2 + \sum_{j=1}^p \varphi_j \sigma_{t-j}^2 \quad \dots \quad \dots \quad \dots \quad \dots \quad (3.2)$$

Where $\theta_0 > 0, \theta_i \geq 0, \varphi_j \geq 0$

In the GARCH (p, q) model, the conditional variance depends upon the square of past values of process ε_t and lag of conditional variance σ_{t-1}^2 . The condition of non-negativity of parameter also applied in this model.

3.1.2. GJR (p, q) Model

Glosten, *et al.* (1993) introduced (GJR) model in 1993. GJR model is a significant extension in a simple GARCH model. This model also captures the asymmetries in ARCH process. GJR model also accounts for the leverage effect in a financial series.

The general representation of the GJR model is:

Conditional Mean Equation

$$R_t = \alpha_0 + \beta X_t + \varepsilon_t \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad (3.3)$$

Where $\varepsilon_t = z_t \sigma_t, \quad z_t \sim N(0,1)$

Conditional Variance Equation

$$\sigma_t^2 = \theta_0 + \sum_{i=1}^q \theta_i \varepsilon_{t-i}^2 + \sum_{i=1}^q \delta_i \varepsilon_{t-i}^2 G_t + \sum_{j=1}^p \varphi_j \sigma_{t-j}^2 \quad \dots \quad \dots \quad (3.4)$$

Where $\theta_0 > 0, \theta_i \geq 0, \varphi_i \geq 0, 0 \leq \delta_i \leq 1$ Range of parameter of leverage effect. $G_t = 1$ when $\varepsilon_{t-1} < 0$ and $G_t = 0$ when $\varepsilon_{t-1} \geq 0$.

3.2. Modelling for Volatility Spillover

The multivariate GARCH diagonal BEKK has been used to measure the spillover effect between the markets. The Chow break-point test is used to test the breaks in return series, especially due to the financial crisis.

3.2.1. Chow Break-Point Test

The Chow break-point test is proposed by Chow (1960). Chow test is employed to identify the structural breaks due to the financial crisis, whether the coefficient of linear regressions are equal in different data sets. The Chow test is used to identify the structural breaks in return series due to the global financial crisis.

$$F = \frac{(RSS_{UR} - (RSS_{Res1} + RSS_{Res2}))/K}{(RSS_{Res1} + RSS_{Res2})/(N - 2K)} \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad (3.5)$$

RSS_{URes} is the residual sum of square of whole data sets. RSS_{Res1} is the residual sum of square of the first part of data. RSS_{Res2} is the residual sum of square of second part of data N is the number of observations and K is the number of parameters.

3.2.2. Multivariate GARCH Diagonal BEKK

Baba, Engle, Kraft, and Kroner (1990) proposed the BEKK model to guarantee the positive definiteness of the variance-covariance matrix H_t . the BEKK model is also known as a restricted version of the VEC model. When A and G matrices become diagonal then the BEKK model is converted into Diagonal BEKK which is introduced by Bollerslev, Engle, and Wooldridge (1988).

$$R_t = \sum_{i=1}^k \vartheta_i R_{t-i} + \varepsilon_t \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad (3.6)$$

Where $R'_t = [r_1 \quad r_2 \quad \dots \quad r_n]$ and $\varepsilon'_t = [\varepsilon_1 \quad \varepsilon_2 \quad \dots \quad \varepsilon_n]$

The Diagonal BEKK (p,q,k) Model

$$H_t = \delta \delta' + \sum_{i=1}^q \sum_{k=1}^k A'_{ki} \varepsilon_{t-i} \varepsilon'_{t-i} A_{ki} + \sum_{i=1}^p \sum_{k=1}^k G'_{ki} H_{t-i} G_{ki} \quad \dots \quad \dots \quad (3.7)$$

Where $H_t = \begin{bmatrix} h_{11,t} & \dots & h_{k1,t} \\ \vdots & \ddots & \vdots \\ h_{k1,t} & \dots & h_{kk,t} \end{bmatrix}$ and $\delta = \begin{bmatrix} \delta_{11} & \dots & 0 \\ \vdots & \ddots & \vdots \\ \delta_{k1} & \dots & \delta_{kk} \end{bmatrix}$

$Diagonal A = [a_{k1}, \dots, a_{kk}]$, and $Diagonal G = [g_{k1}, \dots, g_{kk}]$

Where H, A, δ and G are parameter matrices. δ is a lower triangular matrix. The constant term decomposition of into a multiplication of two triangular matrices, is to ensure the variance covariance matrix H positive definiteness. The GARCH Diagonal BEKK model is used here instead of GARCH-BEKK because of the large parameter, the GARCH-BEKK, has a convergence problem.¹

3.3. Description of Data and Sources

The daily data of stock market indices have been used for the period between 2005 and 2016. The leading stock markets are taken from Asia, Europe, America, and Gulf regions. The American markets are S&P 500, DOW JONES (DJI), and NASDAQ 100. Leading markets from Europe are London (FTSE 350) and German (GDAXI) stock exchange. The prominent markets from Asia are Pakistan (PSX 100), Japan (NIKKEI 225) and Hong Kong (HIS) stock markets. The Dubai financial market (DFM) is taken from Gulf countries.

4. ESTIMATIONS AND ANALYSIS

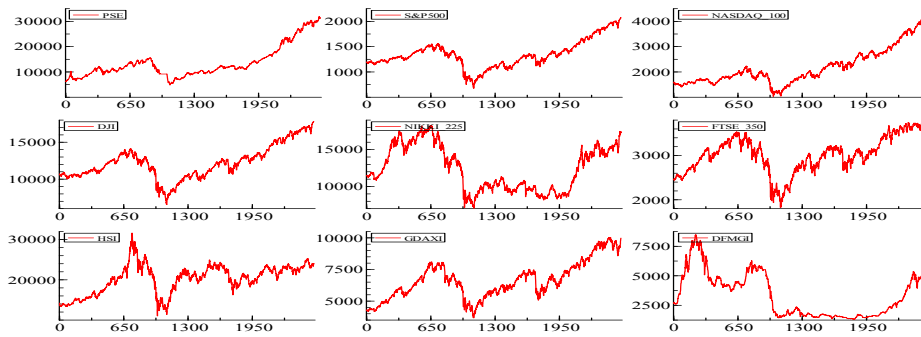
This section describes results and discussion of results.

4.1. Graphical Analysis

Figure 1 indicates that all the series have an upward trend and a sharp decline around 2008 due to the global financial crisis. Then again, there is a continuous upward trend with some fluctuations. It shows that the series is trendy and seems non-stationary at level.

¹Khan, S.A (2012). <https://asadzaman.net/my-students/>

Fig. 1. Graph of Series at Level



A single return series (PSX 100) is used for further data visualisation, and other return series could be visualised in the same manner. Figure 2 given below is representing a return series of PSX 100 index. In financial econometrics, the spread is characterised as volatility. Figure two shows that the spread does not remain the same throughout the series, which is known as Heteroscedasticity. The circles in Figure 2 are indicating low and high volatility. According to The Efficient Market Hypothesis (EMH), returns are unpredictable and show mean reversion behaviour.” We can easily distinguish between low volatility clustering and high volatility clustering period. The greater depreciation from a constant level (mean of return series) indicates high volatility clustering, and less depreciation illustrates low volatility clustering. If all effects are combined, they indicate the ARCH (Auto-Regressive Conditional Heteroscedasticity) effect.

Fig. 2. Graph of Given Return Series

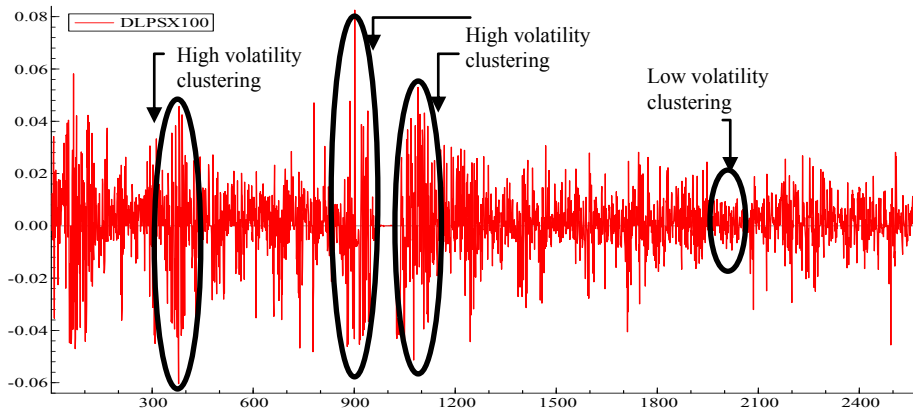
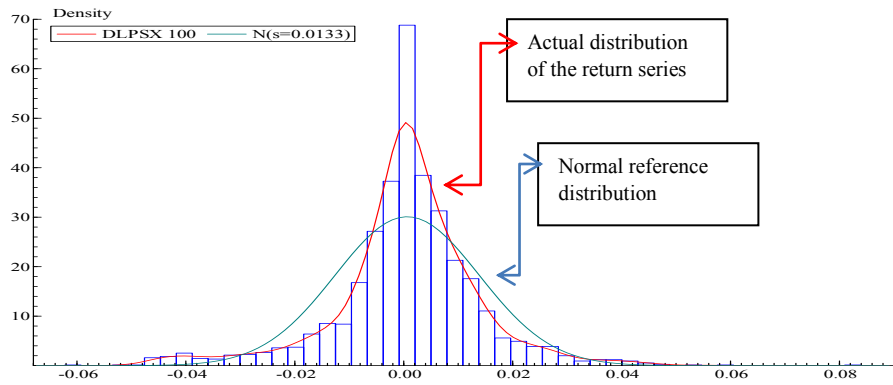


Figure 3, illustrates the distribution of the return series of PSX 100 index. In this graph, the blue line shows the normal reference distribution of return series. The red line indicates the actual distribution of the return series. Histograms describe the outliers (extreme values) in return series.

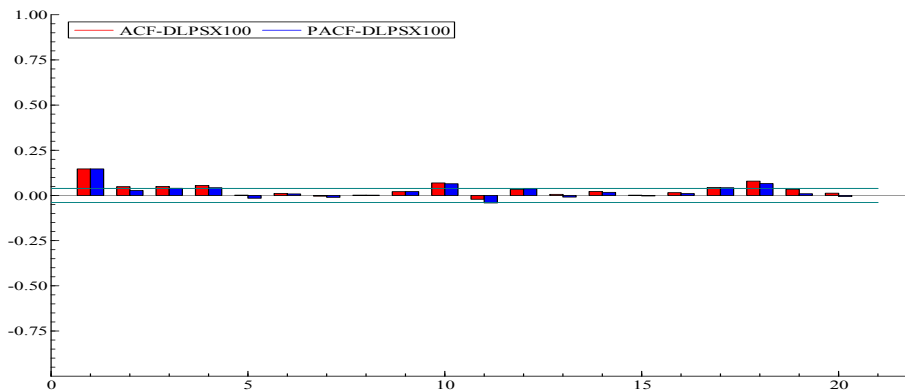
Fig. 3. Graphs Distribution of the Return Series



The distribution of return series has heavy tails and is leptokurtic, which shows that the distribution of return series is non-normal. This is due to the different response of market players who have the same information from the same market.

Figure 4, given below, presents ACF (Auto-correlation function) and PACF (Partial Auto-correlation function) of return series of PSX 100 index. The green straight lines in this graph show a 95 percent confidence interval. If any bar of ACF and PACF is outside these lines, it means at that lag the values are autocorrelated. It significantly varies from zero. The ARMA (p, q) process specifies through the significant lags of ACF and PACF. The ACF specifies the MA (q) process. PACF specifies the AR (p) process. In order to identify the ARMA process, prominent lags of ACF and PACF are focused upon. In this graph 1st lags of ACF is significantly prominent and 1st lag of PACF is also significant and prominent.

Fig. 4. Graphs of ACF and PACF of Return Series



4.2. Summary Statistics

The results in Table 1 show the initial statistics of return series of stock markets indices. The statistics unveil some indications about the behaviour of stock markets. The distributions of return are non-normal, heavy tails and leptokurtic. The mean of all

returning series is about zero, which implies that return series have a mean reversion behaviour. The standard deviation of return series describes the dispersion from the mean value, which shows that if the return series has a greater standard deviation, it has more deviations from the mean value. The skewness deals with the asymmetry of the distribution. The distributions of PSX 100, S&P 500, NASDAQ 100, DJI, NIKKEI 225, FTSE 350 and DFMGI return series are negatively skewed, which means that the return of these stock markets is less than average return. The distributions of HIS and GDAXI are positively skewed, which implies that the returns of these markets are more than average returns. The Jarque-Bera (J.B) test with a null hypothesis of a normal distribution is employed. Jarque-Bera statistics of all returning series are significant, which means the distribution of all returning series is non-normal.

Table 1

Summary of Statistics

Series	Mean	Standard deviation	Skewness	Jarque Bera	Excess Kurtosis	Q-stat (5)	Q2-stat (5)	ARCH 1-2	KPSS
KSE 100	0.0006	0.0133	-0.3054	1096.1 (0.000)	3.1075 (0.000)	76.12 (0.000)	1167.51 (0.000)	266.88 (0.000)	0.2073
S&P 500	0.0002	0.0427	-0.0409	17088 (0.000)	11.448 (0.000)	45.484 (0.000)	1131.31 (0.000)	266.72 (0.010)	0.1965
NASDAQ 100	0.0003	0.0736	-0.0587	7685.9 (0.000)	8.6282 (0.000)	24.928 (0.000)	765.777 (0.000)	156.96 (0.000)	0.2005
DJI	0.0001	0.0716	-0.0851	3168 (0.000)	11.499 (0.000)	45.037 (0.000)	1123.85 (0.000)	283.89 (0.006)	0.1548
NIKKEI 225	0.0001	0.0653	-0.0737	9597.9 (0.000)	8.885 (0.000)	10.564 (0.000)	1396.71 (0.000)	489.45 (0.000)	0.1994
HIS	0.0002	0.0856	0.1459	18971 (0.000)	10.12 (0.000)	8.387 (0.000)	1361.38 (0.000)	361.66 (0.004)	0.0525
FTSE 350	0.0001	0.0018	-0.2879	7088.8 (0.000)	8.2401 (0.000)	39.367 (0.000)	1130 (0.000)	147.29 (0.009)	0.0569
GDAXI	0.0003	0.0637	0.5297	5010.5 (0.000)	7.1719 (0.000)	16.783 (0.000)	686.71 (0.000)	111.39 (0.000)	0.07411
DFMGI	0.0001	0.0883	-0.7778	19612 (0.002)	11.135 (0.000)	32.381 (0.000)	166.23 (0.000)	44.647 (0.000)	0.4874

Null Hypotheses (All Null Hypotheses are for nth order).

KPSS H0: Return series is level stationary, Asymptotic significant values 1 percent (0.739), 5 percent (0.463), 10 percent (0.347). Q-stat (return series) there is no serial autocorrelation. Q2-stat (square return series) H0: there is no serial autocorrelation. Jarque-Bera H0: distribution of series is normal. LM-ARCH H0: there is no ARCH effect. Use these Asymptotic Significance values of t-stat 1 percent (0.01), 5 percent (0.05), 10 percent (0.1) and compare these critical values with P-values (Probability values). P-values are in the parenthesis.

The Excess kurtosis in Table 1 of all returns series is significant, which means that return series distributions are leptokurtic and indicates that the probability of large values is more than normal return values. Q-stat of return series is significant, which shows that there is serial autocorrelation in return series. Q-stat of squared return series is significant, which shows that there is serial autocorrelation in square return series. LM-

ARCH test validates that there is ARCH effect in return series. KPSS is a unit root test with a null hypothesis of stationary series. KPSS test results of all variable show that the return series is level stationery.

4.3. Volatility Modelling

A lot of empirical work on volatility modelling exists in financial literature. However, the predictability and modelling of volatility are still challenging for researchers. Many researchers in their studies employed GARCH family models for volatility modelling and forecasting. Akhtar and Khan (2016) used GARCH models for volatility modelling of KSE 100 index. Lim and Sek (2013) employed a symmetric and asymmetric GARCH model for volatility modelling of Malaysia. Ghouse and Khan (2017) used GARCH models to capture the dynamic symmetric and asymmetric effects in return series of leading financial markets.

The results in Table 2 describe the volatility modelling statistics of return series, and Table 3 contains the results of the residual analysis. the equation structure of one series (PSX 100) is provided for convenience in reading table results.

The GJR model is employed for PSX 100 volatility modelling. The estimated conditional mean Equation (4.3) is derived from Equation (3.9) and the estimated conditional dispersion Equation (4.4) is derived from Equation (3.10). The P-values are in parenthesis.

$$R_t = 0.0008 + 0.8900R_{t-1} - 0.9000\varepsilon_{t-1} \quad \dots \quad \dots \quad \dots \quad \dots \quad (4.1)$$

(0.0000) (0.0000) (0.0000)

$$\sigma_t^2 = 0.0056 + 0.1460\varepsilon_{t-2}^2 + 0.3234\varepsilon_{t-1}^2 G_t + 0.8031\sigma_{t-1}^2 \quad \dots \quad \dots \quad (4.2)$$

(0.9010) (0.0000) (0.0000) (0.0000)

In the first equation, AR (1) term R_{t-1} is statistically significant which means that the current return depends upon 1st lag. The MA (1) term ε_{t-1} is also different from zero, which shows the relationship between past and current variations, while the constant term is also significant. The second equation describes that the PSX 100 series has an asymmetric effect, because the GJR term $\varepsilon_{t-1}^2 G_t$ is significant which indicates the existence of a leverage effect. The leverage effect directs that the current return is negatively correlated with future volatility, while the ARCH ε_{t-2}^2 and GARCH terms σ_{t-1}^2 are also significant at 1 percent level of significance.

Similarly, the returns series of NIKKEI 225 also have asymmetric effects. All other series S&P 500, DOW JONES (DJI), NASDAQ 100, FTSE 350, GDAXI, HIS and DFMGI are having symmetric effects. Most of the parameters are statistically significant at 5 percent level of significance. ARCH and GARCH terms are also significant in the models, meaning that the return series are subject to ARCH effect.

The persistence of shock in return series is very important factor for forecasting different effects persisting in return series and their decay time. If it becomes close to 1, it means the persistence of ARCH and GARCH effect takes a long time to decay. If it is not close to 1 or less than 1, it shows that the persistence of ARCH and GARCH effect takes a short time to decay. As shown in Table 2, the persistence of shock estimators value is close to 1, which means that the persistence of ARCH and GARCH effects takes a long time to decay from all the series.

Table 2

Volatility Modeling of Stock Markets

	PSX-100	NIKKEI-225	HIS	S&P 500	NASDAQ 100	DOW JONES	FTSE 350	GDAXI	DFMGI
	ARMA(1,1)	ARMA(0,0)	ARMA(0,0)	ARMA(1,1)	ARMA(0,0)	ARMA(2,1)	ARMA(0,0)	ARMA(1,1)	ARMA(1,1)
	GJR (1,1)	GJR (1,1)	GARCH (3,2)	GARCH (1,2)	GARCH (1,1)	GARCH (1,1)	GARCH (1,1)	GARCH (1,1)	GARCH (1,1)
Conditional Mean Equation									
Constant	0.0009	0.0006	0.0006	0.0008	0.0011	0.0008	0.0006	0.0010	0.0005
α_0	(0.7538)	(0.0093)	(0.0013)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.2032)
AR(1)	1.0000	—	—	0.7395	—	-0.9511	—	0.9396	0.8848
θ_1	(0.0000)	—	—	(0.0000)	—	(0.0000)	—	(0.0000)	(0.0000)
AR(2)	—	—	—	—	—	-0.0560	—	—	—
θ_2	—	—	—	—	—	(0.0039)	—	—	—
MA(1)	-0.9000	—	—	-0.7992	—	0.8958	—	-0.9551	-0.8330
ϕ_1	(0.0000)	—	—	(0.0000)	—	(0.0000)	—	(0.0000)	(0.0000)
Conditional Variance Equation									
Constant	0.0000	0.0475	0.0070	0.0219	0.0232	0.0130	0.0139	0.0218	0.0313
θ_0	(1.0000)	(0.0007)	(0.0830)	(0.0000)	(0.0000)	(0.0005)	(0.0025)	(0.0025)	(0.0633)
ARCH(1)	0.1460	0.0273	—	—	0.0890	0.1112	0.1145	0.0988	0.0630
θ_1	(0.0003)	(0.0240)	—	—	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
ARCH(2)	—	—	0.0523	0.1433	—	—	—	—	—
θ_2	—	—	(0.0000)	(0.0000)	—	—	—	—	—
GARCH(1)	0.8032	0.8839	2.0078	0.8481	0.8991	0.8841	0.8790	0.8943	0.9311
φ_1	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
GARCH(2)	—	—	1.7205	—	—	—	—	—	—
φ_2	—	—	(0.0000)	—	—	—	—	—	—
GARCH(3)	—	—	0.6600	—	—	—	—	—	—
φ_3	—	—	(0.0000)	—	—	—	—	—	—
GJR(1)	0.3234	0.1287	—	—	—	—	—	—	—
δ_1	(0.0000)	(0.0000)	—	—	—	—	—	—	—
Persistence of shock	0.9109	0.9755	0.9996	0.9915	0.9883	0.9954	0.9935	0.9932	0.9941

Null Hypotheses (All Null Hypotheses are for nth order).

AR (p) H0: $\theta_i = 0$ No AR Process, MA (q) H0: $\phi_i = 0$ No MA Process, ARCH H0: $\theta_i = 0$ No ARCH effect, GARCH H0: $\varphi_i = 0$ No GARCH effect, Leverage effect H0: $\delta_i = 0$ No leverage effect. P-values are in the parenthesis.

Table 3

Residual Analysis

Series	Parameter	Jarque Bera	Q-Stat (5)	Q-Stat (10)	Q ² -Stat (5)	Q ² -Stat (10)	LM-ARCH (1-2)	LM-ARCH (1-5)
PSX-100		7.0272	0.0019	0.0024	0.0020	0.0039	0.0004	0.0004
	ARMA(1,1) GJR (1,1)	(0.0000)	(0.9999)	(1.0000)	(0.9999)	(1.0000)	(0.9999)	(1.0000)
NIKKEI-225		509.46	2.0605	6.0220	0.6678	5.1253	0.2047	0.1380
	ARMA(0,0) GJR (1,1)	(0.0000)	(0.8407)	(0.8134)	(0.8807)	(0.7440)	(0.8149)	(0.9835)
HIS		128.04	1.7793	5.1972	5.2051	13.983	0.3964	0.5536
	ARMA(0,0) GARCH (3,2)	(0.0000)	(0.8787)	(0.8776)	(0.3913)	(0.5267)	(0.6727)	(0.7356)
S&P 500		524.96	4.5842	7.4715	1.2465	9.7895	0.2319	0.2597
	ARMA(1,1) GARCH (1,2)	(0.0000)	(0.2049)	(0.4867)	(0.5361)	(0.2008)	(0.7930)	(0.9350)
NASDAQ 100		213.74	2.8643	5.1957	5.8315	14.408	2.7272	1.1573
	ARMA(0,0) GARCH (1,1)	(0.0000)	(0.2387)	(0.6360)	(0.1201)	(0.0717)	(0.0656)	(0.3279)
DOW JONES		438.61	5.2781	8.9697	8.5410	17.475	3.8500	1.6483
	ARMA(2,1) GARCH (1,1)	(0.0000)	(0.0714)	(0.2548)	(0.0360)	(0.0255)	(0.0214)	(0.1438)
FTSE 350		134.01	3.5698	5.2425	3.7790	5.0251	0.6032	0.7742
	ARMA(0,0) GARCH (1,1)	(0.0000)	(0.6128)	(0.8743)	(0.2863)	(0.7548)	(0.5471)	(0.5682)
GDAXI		309.27	4.5445	7.4357	6.9227	8.9998	0.8606	1.4246
	ARMA(1,1) GARCH (1,1)	(0.0000)	(0.2083)	(0.4904)	(0.0744)	(0.3423)	(0.4230)	(0.2121)
DFMGI		12835	6.7335	12.502	3.4343	8.3277	0.2255	0.6888
	ARMA(1,1) GARCH (1,1)	(0.0000)	(0.0808)	(0.1301)	(0.3293)	(0.4021)	(0.7981)	(0.6319)

Null Hypotheses (All Null Hypotheses are for nth order).

Q-stat (return series) there is no serial autocorrelation. Q²-stat (square return series) H0: there is no serial autocorrelation. Jarque-Bera H0: distribution of series is normal. LM-ARCH H0: there is no ARCH effect. P-values are in the parenthesis.

Tables 3, illustrates the post-estimation results (Residual analysis). The Jarque-Bera test (Normality test) results show nonnormal distributions of residuals. The Q-stat are insignificant up to 10th lags, accept the null hypothesis that there is no serial autocorrelation in the standardised residuals. If the Q-stat on squared standardised residuals is insignificant up to 10th lags accept the null hypothesis of no serial autocorrelation in squared standardised residuals. LM-ARCH test is also insignificant up to 5th lags accept the null hypothesis of no ARCH effect remains in series residuals.

4.4. Identification of Structural Break

The Chow break-point test was employed to identify the structural break in the return series due to the global financial crisis. As shown below, all the breaks are significant which indicates that the global financial crisis affected all the series to some extent.

Table 4
Chow Test Statistics

Series	Chow Statistic	Probability value
KSE 100	67.021	0.0013
S&P 500	45.044	0.0123
NASDAQ 100	25.918	0.0356
DJI	41.371	0.0292
NIKKEI 225	18.564	0.0474
HIS	29.873	0.0291
FTSE 350	30.367	0.0108
GDXI	61.831	0.0075
DFMGI	34.3072	0.0258

Ho: there is no structural break.

H1: there is a structural break.

4.5. Volatility Spillover Effect

The multivariate GARCH Diagonal BEKK model was employed to trace out the dynamic linkages between Pakistani and leading foreign stock markets. A simple multivariate equation is shown. There are heavy complicated calculations behind these results [for further details see Khan (2012)].² The whole data set for these estimations from 2005 to 2016 are used.

²Khan, S. A. (2012). <https://asadzaman.net/my-students/>

$$\begin{aligned}
 H_{t,PSX} = & 0.4557 + 0.461S\&P + 0.1061NAS + 0.6745DJ + 0.0834NIKK + 0.0310HIS \\
 & (0.0010) (0.0051) (0.0076) (0.00342) (0.0914) (0.0875) \\
 & + 0.1546FTSE + 0.2107GDXI + 0.6745DFM + 0.8131H_{t-1} \dots \dots (4.3) \\
 & (0.9010) (0.0001) (0.0000) (0.0516)
 \end{aligned}$$

It is clear that the coefficients of the S&P 500, NASDAQ 100, DOW JONES and DFMGI are statistically significant at 1 percent level of significance. The coefficients of HIS, NIKKEI 225 and FTSE 350 are statistically significant at 10 percent level of significance. It shows that there is a huge volatility spillover effect from S&P 500, NASDAQ 100, DOW JONES and DFMGI to PSX 100. It also indicates that there is a very weak volatility spillover effect from HIS, NIKKEI 225 and FTSE 350 to PSX 100; thus, they can be neglected to some extent. The coefficients of GDXI are statistically insignificant.

The data are divided into two parts; the first part contains the crisis period, and the second part consists of the post-crisis period. The MGARCH model has been employed on both data sets. The results are indicating that there is a strong linkage among these markets in both periods. Equation (4.4) shows the results of the first part of the data set. The results show a significant volatility spillover effect from S&P 500, NASDAQ 100, DOW JONES and DFMGI to PSX 100 in the crisis period. Equation (4.5) illustrates the results of the second part of the data set. The results indicate a significant volatility spillover effect from S&P 500, NASDAQ 100, DOW JONES and DFMGI to PSX 100 in the post-crisis period.

$$\begin{aligned}
 H_{t,PSX} = & 0.0081 + 0.2806S\&P + 0.1427NAS + 0.0156DJ + 0.6410DFM + 0.52331H_{t-1} (4.4) \\
 & (0.0000) (0.0061) (0.0078) (0.0410) (0.0001) (0.0000)
 \end{aligned}$$

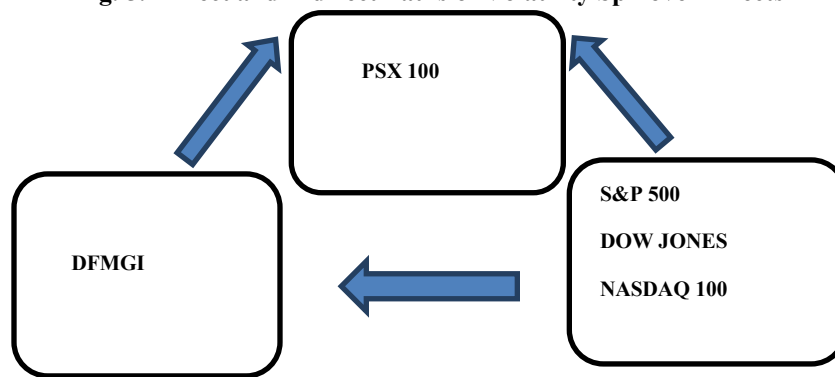
$$\begin{aligned}
 H_{t,PSX} = & 0.010 + 0.3401S\&P + 0.5497NAS + 0.4301DJ + 0.3494DFM + 0.7652H_{t-1} (4.5) \\
 & (0.0050) (0.0081) (0.0009) (0.0001) (0.0000) (0.0000)
 \end{aligned}$$

Likewise, the MGARCH DBEKK model was employed for DFMGI for both periods. Volatility spillover effects were found from S&P 500, NASDAQ 100 and DOW JONES to DFMGI. Equation (4.6) shows the results of the first part of the data set. The results show a significant volatility spillover effect from the S&P 500, NASDAQ 100 and DOW JONES to DFMGI in the crisis period. Equation (4.7) illustrates the results of the second part of data set. The results indicate a significant volatility spillover effect from S&P 500, NASDAQ 100 and DOW JONES to DFMGI in post-crisis period.

$$\begin{aligned}
 H_{t,DFM} = & 0.0093 + 0.2622S\&P + 0.1570NAS + 0.1134DJ + 0.0410PSX + 0.98671H_{t-1} (4.6) \\
 & (0.0059) (0.0101) (0.0280) (0.0019) (0.09001) (0.0008)
 \end{aligned}$$

$$\begin{aligned}
 H_{t,DFM} = & 0.0597 + 0.5681S\&P + 0.1034NAS + 0.1289DJ + 0.6745PSX + 0.5734H_{t-1} (4.7) \\
 & (0.9010) (0.0001) (0.0000) (0.0001) (0.8003) (0.0000)
 \end{aligned}$$

While PSX 100 remains insignificant in both equations, which shows that there is no volatility spillover effect from PSX 100 to DFMGI. In the first equation, PSX 100 is significant at 10 percent level of significance. The results are explaining direct and indirect volatility spillover effects from S&P 500, NASDAQ 100, DOW JONES and DFMGI to PSX 100. Figure 5 explains the direct and indirect paths.

Fig. 5. Direct and Indirect Paths of Volatility Spillover Effects

5. CONCLUSION

This study discusses the time-varying volatility and explores the spillover effects among equity markets. Since the past decade, the Dubai market has become very attractive for Pakistani investors, especially in the real estate sector. Pakistani are amongst top investors in the real estate sector considering Dubai as a safe haven for investment. This phenomenon is examined in the present study. This study provides important conclusions for financial institutions, market players, and portfolio managers enabling them to detect the nature of markets and level of linkages among the financial markets. Dubai is the nearest top market for Pakistani market players to be utilised as hedging and portfolio management. Based on the findings of this study, investors may minimise their risk. The portfolio managers can use these results in their diversified portfolios investment, which is badly affected by stock market prices. The stability of stock market prices is very important for foreign direct investment and domestic investment, which improves macroeconomic stability and positively affects economic growth. This study may have a significant impact on the trading behaviour of the PSX 100 that is beneficial for the retail investors, institutional investors (both local and foreigner) and mutual funds managers. The explored integration between Pakistani and Dubai markets may also be utilised by foreign investors who are interested in the Pakistani energy sector.

REFERENCES

- Ahmed, R. R., J. Veinhardt, D. Štreimikienė, S. P. Ghauri, and M. Ashraf (2018) Stock Returns, Volatility and Mean Reversion in Emerging and Developed Financial Markets. *Technological and Economic Development of Economy* 24:3, 1149–1177.
- Akhtar, S. and Naimat U. Khan (2016) Modelling Volatility on the Karachi Stock Exchange, Pakistan. *Journal of Asia Business Studies* 10: 3, 253–275.
- Alsukker, A. (2010) Dubai Crisis. SSRN Paper No, 1663548. It can be viewed at: <https://ssrn.com/abstract=1663548>
- Amjad, R. and M. Din (2010) Economic and Social Impact of Global Financial Crisis: Implications for Macroeconomic and Development Policies in South Asia. (PIDE Monograph Series, 1).

- Angkinand, A. P., J. R. Barth, H. Kim, and B. Gup (2009) Spillover Effects from the US Financial Crisis: Some Time-Series Evidence from National Stock Returns. *The Financial and Economic Crises: An International Perspective* 24–52.
- Aziz, K. (2008) Investors from Pakistan Buying Property Worth Millions of Dollars at UAE. It can be viewed at: www.chowrangi.pk.
- Aziz, Z. and Iqbal (2017) Testing the Dynamic Linkages of the Pakistani Stock Market with Regional and Global Markets. *Lahore Journal of Economics* 22:2, 89–116.
- Baba, Y., R. F. Engle, D. F. Kraft, and K. F. Kroner (1990) Multivariate Simultaneous Generalised ARCH, Department of Economics. University of California at San Diego. (Working Paper).
- Bollerslev, T. (1986) Generalised Autoregressive Conditional Heteroskedasticity. *Journal of Econometrics* 31:3, 307–327.
- Bollerslev, T., R. F. Engle, and J. M. Wooldridge (1988) A Capital Asset Pricing Model with Time-Varying Covariances. *Journal of Political Economy* 96:1, 116–131.
- Cali, M., I. Massa, and D. W. te Velde (2008) The Global Financial Crisis: Financial Flows to Developing Countries Set to Fall by One Quarter. London. ODI blog 13.
- Chow, G. C. (1960) Tests of Equality between Sets of Coefficients in Two Linear Regressions. *Econometrica. Journal of the Econometric Society* 591–605.
- Draz, M. U. (2011) Impact of Financial Crises on Pakistan and China: A Comparative Study of Six Decades. *Journal of Global Business and Economics* 3:1, 174–186.
- Ellaboudy, S. (2010) The Global Financial Crisis: Economic Impact on GCC Countries and Policy Implications. *International Research Journal of Finance and Economics* 41, 180–193.
- Engle, R. F. (1982) Autoregressive Conditional Heteroscedasticity with Estimates of the Variance of United Kingdom Inflation. *Econometrica* 50:4, 987–1007.
- Fraser, P. and O. Oyefeso (2001) The UK Stock Market's Relationship with us and European Stock Markets: Is the UK Stock Market Snuggling-up to the US -or to Europe? In *University of Otago Department of Finance Seminar Series*.
- Gabbatt, A. (2009) Dubai on the Brink—Latest Developments. *The Guardian*. It can be viewed at: <https://www.theguardian.com/world/2009/nov/27/dubai-financial-crisis-debt>
- Ghose, G. and S. A. Khan (2017) Tracing Dynamic Linkages and Spillover Effect between Pakistani and Leading Foreign Stock Markets. *Review of Financial Economics* 35, 29–42.
- Glosten, L. R., R. Jagannathan, and D. E. Runkle (1993) On the Relation between the Expected Value and the Volatility of the Nominal Excess Return on Stocks. *The Journal of Finance* 48:5, 1779–1801.
- Hasan, Z. (2010) Dubai Financial Crisis: Causes, Bailout and After— A Case Study. *Journal of Islamic Banking and Finance* 47–55.
- Iqbal, Z. and A. Sattar (2005) The Contribution of Workers' Remittances to Economic Growth in Pakistan. Pakistan Institute of Development Economics. (Working Paper No. 2005: 187).
- Jan, W. and K. Jebran (2015) Empirical Analyses of Volatility Spillover from G5 Stock Markets to Karachi Stock Exchange. *Pakistan Journal of Commerce and Social Sciences* 9:3.

- Jawed, S. M. (2015) An Analysis of Coincidence between KSE-100 and S&P 500 Index Using Spectral Approach. *Pakistan Journal of Engineering, Technology and Science* 4:2.
- Jebran, K., S. Chen, I. Ullah, and S. S. Mirza (2017) Does Volatility Spillover among Stock Markets Varies from Normal to Turbulent Periods? Evidence from Emerging Markets of Asia. *The Journal of Finance and Data Science* 3:(1-4), 20–30.
- Kawai, M., D. G. Mayes, and P. Morgan (Eds.) (2012) *Implications of the Global Financial Crisis for Financial Reform and Regulation in Asia*. Edward Elgar Publishing.
- Kharchenko, I. and P. Tzvetkov (2013) Estimation of Volatilities and Spillover Effects between Developed and Emerging Market Economies. Department of Economics, Lunds Universitet. Retrieved from <http://lup.lub.lu.se/luur/download?func=downloadFile&recordOId=3801343&fileOId=3813321>
- Li, Y. and D. E. Giles (2015) Modelling Volatility Spillover Effects between Developed Stock Markets and Asian Emerging Stock Markets. *International Journal of Finance and Economics* 20:2, 155–177.
- Lim, C. M. and S. K. Sek (2013) Comparing the Performances of GARCH-type Models in Capturing the Stock Market Volatility in Malaysia. *Procedia Economics and Finance* 5, 478-487.
- Mishkin, F. S. (2011) Over the cliff: From the subprime to the global financial crisis. *Journal Economic Perspectives* 25:1, 49–70.
- Nazir, M. S., R. Safdar, and M. I. Akram (2012) Impact of Global Financial Crisis on Banks' Financial Performance in Pakistan. *American Journal of Scientific Research* 78, 101–110.
- Onour, I. (2010) The Global Financial Crisis and Equity Markets in Middle East Oil Exporting Countries. University Library of Munich, No. 23332.
- PES (2010) *Economic Survey of Pakistan*. Ministry of Finance Pakistan. It can be viewed at: http://www.finance.gov.pk/survey_1617.html
- Phulpoto, L. A., A. B. Shah, and F. M. Shaikh (2012) Global Financial Crises and Its Impact on Banking Sector in Pakistan. *Journal of Asian Business Strategy* 2:6.
- SBP (2007) Annual Report. Karachi: State Bank of Pakistan. It can be viewed at: <http://www.sbp.org.pk/reports/annual/>
- SBP (2008) Annual Report. Karachi: State Bank of Pakistan. It can be viewed at: <http://www.sbp.org.pk/reports/annual/>
- Wahid, A. and M. Mumtaz (2018) The Paradigm Shift in the Pakistan Stock Exchange's Financial Integration Post-FTA and CPEC. *Lahore Journal of Economics* 23:1, 21–50.
- Zia-ur-Rehman, M., Z. A. Shah, and R. Mushtaq (2011) Sources of Return and Volatility Spillover for Pakistan: An Analysis of Exogenous Factors by Using EGARCH Model. *International Conference on Business and Economics Research* 16, 151–157.

The Production of Terrorism in Pakistan: A Religious Market Explanation

FAIZ UR REHMAN

Does intervention in religious market produce negative externalities? To explore this question, firstly, I market for religious products secondly, I provide a chronological discussion on the consequences of government interventions in the market of religion in Pakistan. It is argued that an oligopolistic market for religion exists in Pakistan, thus, it is regulated over time by both democratic and non-democratic regimes. Furthermore, it is discussed that the main intent of regulations in the religious market of Pakistan was the appropriation of rent by three players, that is, religious sect(s), incumbent governments, and cold war allies of Pakistan. However, these interventions produced negative externalities over space and time while polarising religious sects and sub-sects. Over the years, these spillovers are realised in the form of sectarian violence which slowly and gradually transformed into an extreme form of conflict, i.e., terrorism.

JEL Classification: L51, K42, Z12

Keywords: Regulations, Religious Market, Violence, Terrorism

1. INTRODUCTION

The prevailing debate about the roots of terrorism in Pakistan emphasises the religious aspect, i.e., sectarianism, which is comprehensively studied through the theories of anthropology, sociology, political science, law and international relations [Zaman (1998); Nasr (2000a,b); Stern (2000); Nasr (2002); Haleem (2003); Khan (2003); Abbas (2004); Nasr (2004); Grare (2007); Malik, *et al.* (2007); Palmer and Palmer (2007); Waseem, *et al.* (2010); Murphy (2012); Riedel (2012)]. Political scientist, Nasr (2000b), defines sectarianism in the following words: “Sectarianism in the Pakistani context refers specifically to organised and militant religiopolitical activism, whose specific aim is to safeguard and promote the sociopolitical interests of the particular Muslim sectarian community, with which it is associated. Its discourse of power promises empowerment to that community in tandem with greater adherence to Islamic norms in public life, as the religious sources and authorities of that community articulate them. These goals are to be achieved through mobilisation of the sectarian identity in question and the

Faiz Ur Rehman <faiz@qau.edu.pk> is Assistant Professor, Quaid-i-Azam University, Islamabad.

Author's Note: The author would like to thank Michael Faure, Paolo Vanin, L.T. Visscher and participants of the Rotterdam Institute of Law and Economics seminar series for their valuable comments. All remaining mistakes are entirely my own.

marginalisation of the rival sectarian community, largely through prolific use of violence.” Thus, the objective of this paper is to study the roots of terrorism through market and intervention perspectives. In particular, I analyse how economic incentives in the religious market motivate and mobilise different players to produce violence, either directly or indirectly, over space and time.

While emphasising economic incentives, this paper provides an alternative explanation to the origin of sectarian conflict and terrorism in Pakistan. A market perspective of religion has been exploited as an analytical framework to explain economically motivated interactions among different players which lead to the production of sectarian violence and terrorism over time.¹ It is argued that the religious market framework provides useful insights on the origin of sectarianism and terrorism as an oligopolistic market exists to produce different religious products in Pakistan.

In this context, to the best of my knowledge, this is the first study to define Islamic religious product(s) and its market explicitly. That is, what is the product available for the exchange?; what is the price of the transaction?; how is the price determined?; what are the available substitutes and complements of religious goods and services?; what is the nature of the market?

Since the seminal contribution of Iannaccone (1992), researchers have considered religious practices as rational and adherents as utility maximisers. For instance, religious organisations provide consumption smoothing technologies to followers [Hungerman (2005); McCleary and Barro (2006); Dehejia, *et al.* (2007)]; greater levels of religious participation are associated with greater level of reported happiness [Johnson, *et al.* (2002)]; a lower probability of committing crimes or engaging in risky behaviour [Gruber and Hungerman (2006)]; and greater level of educational attainment [Iannaccone, *et al.* (1997)]. Similarly, like other economic markets, religious market is also exposed to government interventions.

To analyse the research question in the context of economic incentives and market framework, it is instructive to shed some light on the dynamics of religion in Pakistan. Pakistan is a religiously homogeneous country having 96 percent Muslim population [ARDA (2014)]. On the one hand, religion was used as an identity in the creation of Pakistan in 1947, assumed to provide norms, morality, social legislation and an inner constitution of ethics and compliance to the nation. Thus, it played a significant positive role over the years. Social scientists acknowledge this role in words like “Pakistan: A resilient/hard country [Stewart (2012); Jaffrelot (2015)].” On the other hand, religion became an institution of rent-seeking for legislators, clergies, civil and military bureaucracies and foreign allies of Pakistan. To appropriate rent, religion is continuously regulated over time by both democratic and non-democratic governments.² A significant number of constitutional articles are related to the structure of the religious market. Still, the market is enriched over space and time with different sects and sub-sects within the Muslims’ faith.

¹A religious market refers to a place where religious producers interact with consumers within a market framework. Economics of religion frames religion as a product and those who practice with any particular religion as a consumer [Sherkat and Wilson (1995)].

²Islam is the official religion of Pakistan. There are various articles and clauses in the constitution regarding Muslim’s faith, practice and preaching of the religion [Pakistan (2012)].

Government regulations in the religious market is not a new phenomenon. These have been frequently practiced throughout history. In the contemporary world, on one side, there are countries where a specific religion has been given the monopoly power; while on the other side, a large number of states treat all religions with homogeneous rules and regulations [Yang (2010)].³ Pakistan belongs to the former category of countries, where one religion has been given an official status. According to the study of Grim and Finke (2006), Pakistan was among the top twenty countries where religion was highly regulated.⁴ An extensive literature is available on the effects of government (de)regulations on religious participation, religious activities, human behaviour and welfare effects [Posner (1987); Olds (1994)].⁵

In this context, the following regulations are considered the most significant in Pakistan's religious market. In the education sector, government has introduced *Islamic Study* as a compulsory course and invested in the religious schools (Madrassas) [Malik (1989); Nasr (2000a); Murphy (2012)]. On the fiscal side, Islamic mandatory charity and taxes (Zakat and Ushr) were imposed. In the judiciary, punishment for serious crimes, including theft, robbery and rape under the common law were replaced by the so called *Islamic punishment*. Nevertheless, explanation/interpretation of these regulations under the Islamic Jurisprudence (Sharia Law) is provided through Hanafi'ite jurisprudence. This school differs on social, religious and economic aspects from other schools of Islamic jurisprudence, which have millions of followers in Pakistan.⁶

It is argued that the main intent behind interventions in the religious market of Pakistan is the appropriation of rent by different players. Religious sect(s) received rents from the government in the form of investment in their religious schools, mosques and extended their role to the judicial institution. In return, they supported the prevalent government(s), specifically, the coup and helped (in different forms) the afghan fighters against the former Soviet Union invasion in Afghanistan. The governments, specifically, the dictatorships, backed the regulations to strengthen their domestic legitimacy. And foreign allies provided funds to the government to utilise its role in the cold war through religious institutions. For instance, the government provided support to Afghan fighters against the invasion of the former Soviet Union with the financial, strategic and technical support of the allies. However, the rent backed interventions in the religious market produced negative externalities. Over the years, these externalities are realised in the form of sectarian violence which slowly and gradually transformed into an extreme form of conflict, that is, terrorism.

³Yang (2010) studied that 84 countries have declared an official religion while 56 nations treat all religions equally.

⁴The Grim and Finke (2006) study sample size consists of 196 countries.

⁵Levin (2010) provides a comprehensive literature review about religious activities, health outcomes and well-being.

⁶The Hanafi'ite school is one of the three schools of law within the Sunni Islam. Ibn-i-Khaldun defines the Sunni schools as three: the Hanafi'ite school representing reason, the Zahir'ite school representing tradition and a middle school encompassing the Shafi'ite, Malik'ite and Hanbal'ite schools [Goldziher (1971)].

The remainder of the paper proceeds as follow: Related literature on the causes of terrorism is discussed in Section 2. Section 3 discusses a general economic theory of the religious market while Section 4 applies the theory to the religious market of Pakistan. The constitutional articles and resultant regulations are explained in Section 5. Section 6 deals with the unintended hazards of government interventions. Finally, Section 7 concludes the study.

2. RELATED LITERATURE ON THE CAUSES OF TERRORISM

The determinants which could affect the cost-benefit matrices of a terrorist include economic, political, institutional and demographic factors. In this context, several hypotheses have been presented and tested to understand the causes of terrorism [Krieger and Meierrieks (2011)].⁷ These hypotheses are briefly explained below with a summary of the relevant research in Table 1.

The most extensive research has been carried out on the ‘economic’ causes (poverty and inequality) of terrorism. Are poor societies more prone to terrorists? Conflicting evidence about economic causes has been provided while considering different time periods and regions. Political economists have also studied the role of ‘modernisation’ in the promotion of terrorism. They argue that new forms of lifestyle and communication, urbanisation and higher population density may attract more terrorist attacks, because, these may challenge traditional elements of a society. Again, mixed empirical support has been found about modernisation being a trigger for terrorist activities. This literature further focuses on the role of ‘liberal vs. non-liberal’ economic and political institutions as determinants of terrorist incidents. Liberal democracies are less prone to terrorism as they provide an alternative way of raising voice to disenfranchised segments of a society. Empirical results show that once the regression controls for the liberalisation component of the ‘institutional order,’ the effect of economic conditions become insignificant on terrorism. Relating to this, studies found a non-linear relationship between the type of political set up ‘democracy vs. dictatorship’ and terrorist activities. Nevertheless, inconclusive results have been observed. Furthermore, the role of ‘ethnic and religious fractionalisation’ has also been studied, but an ambiguous effect on terrorist incidents has been found. Lastly, significant contagious effects of terrorism in both space and time have been observed, that is, terrorist activities cluster over space and time. In short, concrete evidence has been found in the literature that terrorism is more likely to emerge in highly populated, non-democratic and instable countries.

Similarly, political economists provide facts and figures that terrorism in Pakistan has its root in the ‘identity conflict,’ including both ethnic and religious fractionalisation. However, few recent studies have found that ‘economic conditions’ also matter for terrorists in Pakistan. Thus, the current study adds to this literature while arguing that the root cause of violence and terrorism lies in the regular intervention of government in the religious market of Pakistan.

⁷Krieger and Meierrieks (2011) provide a comprehensive overview on different hypotheses that link socio-economic and political factors to terrorism.

Table 1

Determinants of Terrorism

Hypothesis	Potential Determinant	Positive Effect	No/Negative Effect
Economic Deprivation	Economic Conditions	Krueger and Maleckova (2003); Kurrild-Klitgaard, <i>et al.</i> (2006); Plumper and Neumayer (2010); Freytag, <i>et al.</i> (2011)	Blomberg and Hess (2005); Azam and Delacroix (2006); Lai (2007); Azam and Thelen (2008)
Modernisation Strain	Economic Performance, Population Dynamics	Krueger and Maleckova (2003); Burgoon (2006)	Azam and Delacroix (2006); Azam and Thelen (2008)
Institutional Order	Economic-Political Institutions, Education	Eubank and Weinberg (2001)	Krueger and Maleckova (2003); Burgoon (2006); Piazza (2008); Plumper and Neumayer (2010)
Political Transformation	Political Stability	Lai (2007); Piazza (2008)	Eubank and Weinberg (2001); Blomberg and Hess (2005)
Identity Conflict	Religion, Minorities	Piazza (2008)	Blomberg and Hess (2005); Azam and Delacroix (2006); Kurrild-Klitgaard, <i>et al.</i> (2006); Azam and Thelen (2008)
Global Order	Economic Integration, International Politics	Freytag, <i>et al.</i> (2011); Burgoon (2006)	
Contagion	Geography, Time	Blomberg and Hess (2005); Enders and Sandler (2005); Lai (2007); Piazza (2007); Plumper and Neumayer (2010)	Literature on Pakistan
Economic Deprivation	Economic Conditions	Nasir, <i>et al.</i> (2011); Shahbaz (2013)	
Institutional Order	Economic-Political Institutions, Education	Nasir, <i>et al.</i> (2011)	
Identity Conflict	Religion, Minorities	Zaman (1998); Nasr (2000b); Stern (2000); Grare (2007); Asal, <i>et al.</i> (2008); Fair, <i>et al.</i> (2010, 2013)	

Indicators used for hypothesis: *Economic Deprivation:* Per capita GDP, poverty or inequality; *Modernisation Strain:* Inflation, unemployment, GDP growth, urbanisation, population growth, size, structure or age; *Institutional Order:* Economic freedom, property rights protection, civil liberties, political rights, literacy or school attainment; *Political Transformation:* Regime stability, conflicts or civil war; *Identity Conflict:* Religious fractionalisation, ethnic or linguistic fractionalisation; *Global Order:* Trade openness, terms of trade, FDI, foreign aid, incidences of conflict or alliances; and *Contagion:* Spatial, climate, elevation, latitude or temporal proximity to terrorism.

3. ECONOMIC THEORY OF RELIGIOUS MARKET

Should the government seek a free or monopolised religious market? For the first time, this question was raised by Adam Smith in his famous book *The Wealth of Nations* (1776). Smith inquired whether optimality in the religious market requires establishing (state funded) monopoly churches or competitive religions. Smith advocated a free religious market and argued that the objective of self-interest motivates a religious scholar (the clergy) as it does in secular markets and firms. He

further added that the benefits of competition, the burdens of monopoly and the hazards of government regulations are as real in the religion as in any other sector of the economy. Smith holds:

“The teachers of each sect, seeing themselves surrounded on all sides with more adversaries than friends, would be obliged to learn that candor and moderation which are so seldom to be found among the teachers of those great sects, who [as a result of legal entry restrictions facing competing sects] ... see nothing round them but followers, disciples and humble admirers. The teachers of each little sect find themselves almost alone, would be obliged to respect those of almost every other sect; and the concessions which they would mutually find in both convenient and agreeable to make one to another might in time, probably reduce the doctrine of the greater part of them to that pure and rational religion, free from every mixture of absurdity, imposture or fanaticism ... This plan of ecclesiastical government, or more properly, of no ecclesiastical government, [would tend to be] productive of the most philosophical good temper and moderation with regard to every sort of religious principle [p. 332; emphasis added] [Smith (1845)].”

Smith presented the argument that if more than one religious sects compete with each other for resources and members, the clergies of each sect will challenge the adversaries and provide high quality of moral standards and beliefs at low prices. Furthermore, Smith emphasises the importance of a larger number of sects like different number of producers in a secular market. He mentioned the importance of a larger number of small sects as:

“The interested and active zeal of religious teachers can be dangerous and troublesome only where there is either but one sect tolerated in the society, or where the whole of a large society is divided into two or three great sects; the teachers of each acting by concert, and under a regular discipline and subordination. But that zeal must be altogether innocent, where the society is divided into two or three hundred, or perhaps, into as many thousand small sects, of which no one could be considerable enough to disturb the public tranquility. The teachers of each sect, seeing themselves surrounded on all sides with more adversaries than friends, would be obliged to learn that candor and moderation which are so seldom to be found among the teachers of those great sects, whose tenets [are] supported by the civil magistrate (p. 332).”

Similarly, Coase (1974) argued that “in the market for goods, government regulation is desirable whereas, in the market for ideas (speech, writing and the exercise of religious beliefs), government regulations are undesirable and should be strictly limited. The government, if it attempted to regulate the market for ideas, would be inefficient and its motives would, in general, be bad, so that, even if it were successful in achieving what it wanted to accomplish, the results would be undesirable.”

On one side, Smith and Coase advocated a free religious market to promote tolerance, peace, ideas and harmony in the society, but on the other side, David Hume argued against the competitive religious market and favoured the establishment of religion by the state. Hume explained that “in the free and unregulated market, each ‘ghostly practitioner’ (i.e., preacher) will have an incentive to maximise the number of his ‘customers’ by disregarding ‘truth, morals, or decency’ and appealing to the ‘passions and credulity of the populace.’ It is necessary for the state to regulate this competition in order to protect the ‘political interests of the society’.”⁸ Hume further added that a state

⁸ See Anderson (1998) for the reference to David Hume on this point.

takes necessary regulatory measures to mute the fanaticism which was associated with independent religious sects. Given the definitions/views of Smith and Hume, the following sections explain the structure and nature of the religious market in Pakistan.

4. THE ISLAMIC RELIGIOUS MARKET

Behavioural and political economists argue that beliefs shape current and future economic decisions of an individual [Benjamin, *et al.* (2010); Leeson (2012); Basten and Betz (2013)]. Beliefs which are subjectively true, objectively, may be true or false.⁹ Every religious belief has the characteristics of either subjectivity or objectivity, or both. Due to the lack of objective evidence, it was a challenge for the economists to explicitly define religious product and its market.¹⁰ However, in the last two decades, economists have extended the tools of market to study different aspects of religion. Religion has been viewed from the market perspective since the seminal work of Iannaccone (1992). In this context, this is the first study to explicitly define Islamic religious product(s) and its market. For instance, what is the product available for the exchange?; what is the price of the transaction?; how is the price determined?; what are the available substitutes and complements of religious goods and services?; what is the nature of the market? Given these questions, this section explains the market characteristics of the Muslims' faith in general and in Pakistan in particular.

A bundle of commodities is available for the exchange in the Islamic religious market. I term the set of products, *Islamic or Sharia Law*. There are some goods and services in the set of Sharia law which are subjectively true, but objectively lack scientific proofs. Examples include prayers, rituals, beliefs on God, heaven, hell, the day of judgment, and life after death. The opportunity cost of consuming such products is the time forgone which would otherwise be available for the labour market and consumption of secular products. Furthermore, Sharia law includes commodities which are not only subjectively true but also possess evidence of objectivity. For instance, laws of inheritance, marriage, divorce, child custody, financial transactions, and property rights. The opportunity cost includes not only time spent on production and consumption but also tangible costs in the form of income and wealth forgone. For example, beliefs on fiscal (Zakat) and monetary (risk sharing, i.e., prohibition of interest) systems [El-Gamal (2006); Vogel and Hayes (1998)], property rights, contract enforcement, government intervention and laws related to crime and punishment, inheritance, marriage, and divorce [Nomani and Rahnama (1994)]. To explain this idea further, consider the following application. In the money market, borrowing and lending is backed by real variables (gold, silver and land related property) to avoid nominal bubbles. Similarly, profit and losses are shared by both parties in the transaction to minimise moral hazard and adverse selection.¹¹ These transactions not only involve time but also money in exchange. Furthermore, different prices prevail in the Islamic religious market, depending on the nature of goods and services, i.e., tangible vs. non-tangible.

⁹The objectively false beliefs lack scientific support. Leeson (2012) called them superstition.

¹⁰Maloney, *et al.* (2010) define religion as a good having three components:

- (1) private satisfaction, which includes hope for an afterlife;
- (2) public camaraderie, which includes joint consumption of public goods, especially charitable works; and
- (3) reputation, respect and social networking.

¹¹For a detail discussion, see Kettell (2011).

The rules and regulations applicable to the Islamic religious market depend on the interpretation of Sharia law. For instance, one school of Islamic jurisprudence (Hanafi'ite) explains distribution of resources (Zakat) through government, while the other (Jafari'ite) argues in favour of individual freedom in the distribution of income [Talbot (2009); Powell (2009)]. The former gives a major role to the government in distribution, while the latter relies on the efficiency of market forces. Each and every individual compares the costs and benefits of different interpretations and decides which jurisprudence to follow.¹² The substitute for a product is the different commodity introduced by a competitive jurisprudence with slightly different characteristics.

4.1. The Religious Market in Pakistan

Violence and terrorism in Pakistan are often correlated with sectarianism rather than with socio-economic and political institutions [Zaman (1998); Nasr (2000b); Stern (2000); Grare (2007); Asal, *et al.* (2008); Fair, *et al.* (2010, 2013)]. Although, sectarian conflict and terrorism are explained through religious intolerance and extremism in Pakistan, nevertheless, there is a dearth of scholarship about the structure and function of the religious market. Thus, this study is also an attempt to fill this gap.

4.1.1. The Constitutional Provision of Religion

Being a predominantly Muslim country, the effects of religion can be seen in different constitutional articles and clauses of Pakistan [ARDA (2014)]. However, the nature and structure of the religious market (free vs. monopoly) is ambiguous in the constitution. Article 2 explicitly states that, "Islam shall be the State religion of Pakistan." If one focuses only on this article, it could be interpreted that there should be a state sponsored monopolised religion. If we read like this, then the question arises, which interpretation (jurisprudence) of the Sharia law should be implemented in Pakistan? What jurisprudence explanation of the Sharia will be acceptable to the majority? As we know, there are different Muslim sects and sub-sects in Pakistan. Although, the fundamental interpretation of the Sharia is same, there may be differences on various social, economic and religious issues. To clarify this ambiguity, the constitution further contains the provision that every sect is free to practice its religion according to its own interpretation. Thus, article 22 (2a) allows a free market for every religious denomination. According to the *Association of Religion Data Archives* (ARDA), religious education is not regulated or controlled by the state of Pakistan [ARDA (2014)].

4.1.2. Does a Religious Monopoly Exist in Pakistan?

If we consider the proportion of followers of a belief, Islam is the dominant religion in Pakistan. According to the 1998 census: 96.28 percent are Muslims, 1.59 percent are Christians, 1.60 percent are Hindus, 0.47 percent are Scheduled Castes and 0.07 percent are others [Pakistan (1998)]. If we further analyse denominational shares in the total population, which will give us an idea about the proportion of followers of each

¹²The preferences for a specific jurisprudence changes overtime when a new interpretation of the Islamic jurisprudence comes to the market. People continuously compare the costs and benefits of their decisions about rituals and tangible products.

sect. According to different sources, two main sects (Sunni and Shi'ite) constitute 70-75 percent and 20-25 percent of the total followers, respectively. Around 95 percent of the customers belong to these two sects which constitute a duopoly market with unequal shares. Due to unequal shares, the market of religion has experienced government interventions over the years.

According to the basic microeconomic theory, a duopolist market leads to inefficient outcomes if the two players collude on prices or output. To correct the inefficiency, it needs government regulations. This is also similar in the case of the religious market, as pointed out by Barro and McCleary (2005): in an unregulated religious market, a natural monopoly can arise. Nevertheless, Bainbridge and Stark (1987) follow Smith's theory of competition and argue that a religious monopoly occurs only if a government involves in coercive behaviour on behalf of the religion. Furthermore, a strong concentration of followers in a particular religion promotes a religious natural monopoly [Barro and McCleary (2005)]. The collective nature of participation and religious beliefs are important reasons to create a religious monopoly [Iannaccone (1992)]. When more individuals adhere to a religion, the higher number of people dispose toward its doctrine. Similarly, Bainbridge and Stark (1987) argue that a centralised authority of the state can use its legitimate power to enforce the state sponsored monopolised religion in a pluralistic market, if it were allowed without the intervention of the government.

Nonetheless, this is not the case in Pakistan. The political demand for an independent state led to the existence of a natural monopoly of the Muslims. After the independence of Pakistan in 1947, the natural distribution of different sects was such that it resulted in the monopoly of the one specific jurisprudence. However, Rehman (2015) discusses that there are more than 100 sects and subsects in today's Pakistan. Therefore, the market structure can be described as oligopoly.

5. LEGAL SHOCKS TO THE RELIGIOUS MARKET AND RENT-SEEKING

This section discusses the history of government interventions in the religious market of Pakistan. It also provides evidence about incentives (public vs. private) to intervene in the religious market.

5.1. The Second Amendment

The 1973 constitution declared Pakistan a religious state and allowed a free market for every denomination. Nonetheless, the first regulation on religion was introduced within a year by the then democratic government. It is implemented through the *Second Amendment*, that explicitly defines the word *Muslim*. The amendment declared a specific religious faction to be non-Muslim and minority.¹³

Theologically, the Second Amendment might be correct, since one of the sects does not accept the most fundamental principle of the Islamic faith.¹⁴ However, it was

¹³To become a Muslim, one must accept that Muhammad (PBUH) is the last Prophet of God. Chapter 33, verse 40 of Qur'an explains "Muhammad is not the father of any of your men, but he is the (Prophetic) Messenger of Allah (God) and the Last of the Prophets; and Allah (God) has full knowledge of all things."

¹⁴Interested readers can find more details on the specified sect on <http://www.pakistani.org/pakistan/constitution/amendments/2amendment.html>

the first attempt to regulate the market which provided a rent-seeking opportunity to different players (government and religious sects) in the religious market. The amendment legalised and institutionalised violence against the banned sect [Khan (2003)], which was the starting point of the sectarian violence in Pakistan.

At the time of the Second Amendment, the *de jure* political power with the religious denominations was insignificant, nevertheless, the *de facto* power with them was significantly high. The main reason was the religious homogenised society. There is considerable evidence that for the rent-seeking groups, a homogeneous polity is easier to exploit [Lipset (1959)].¹⁵ Therefore, the religious players used their *de facto* power of persecution and violence which pulled out one of their competitors from the market. Similarly, the intervention led to religious rent-seeking behaviour in Pakistan. It was an example of the rent-seeking via non-price competition where the competitors, whose fundamental beliefs coincided with each other, forced the government to raise the barriers of entry into the market [Boudreaux (1989)]. Furthermore, implications and externalities of non-price competition have been observed within the few years in the form of dictator Zia-ul-Haq's Islamisation amendments.

5.2. The Islamisation Amendments

General Zia-ul-Haq (July 1977-August 1988) had promulgated a series of ordinances in 1979 to Islamise legal, fiscal and monetary institutions of Pakistan. These amendments broadly include provisions of the Hudood ordinance (punishment for serious crimes under the Sharia Law); elimination of the Riba (interest-free banking); the introduction of profit and loss sharing schemes; establishment of the federal Sharia Court and the Ushr and Zakat (Islamic taxes) ordinances. The detailed chronology of the amendments is illustrated in Table 2.

In these amendments, the most debatable is the *Hudood Ordinance*. Hudood¹⁶ ordinances replaced Pakistan's Penal Code offenses based on the Common Criminal Law procedures with the laws based on the *Hanafi'ite* jurisprudence. As a consequence, punishment for theft, consumption of intoxicants (alcohol), extra-marital sex (fornication) and making false allegations of adultery are replaced by the so called Islamic criminal laws.¹⁷ The explanation of Hudood was limited to the jurisprudence of the Muslim scholar Abu-Hnifa which was rejected by the followers of competitive schools' jurisprudences. A significant scholarship has been written in favour of and against Hudood Ordinances [Kennedy (1992); Cipriani (1993); Polk (1997); Quraishi (1997); Hussain (2006); Weaver (2006); Lau (2007); Mustafa and Cheema (2008); Imran (2013)].

¹⁵Although, religion in Pakistan homogenises the society, however, in the electoral history of Pakistan, religious parties never won a simple majority. In the 1970 general election, three religious parties had won only 18 out of 300 general seats [PILDAT (2013)].

¹⁶Hudood is an Arabic word, literal meaning 'limit' or 'restriction.'

¹⁷Hudood includes Offenses Against Property Ordinance (prohibiting theft); Prohibition Order (prohibiting the consumption of intoxicants); Offence of Zina Ordinance (prohibiting adultery and fornication); and Offence of Qazf Ordinance (prohibiting false allegations of adultery) [Punjab Police (1979)].

Table 2

General Zia-ul-Haq Constitutional Amendments

No.	Name and Date of Institutional Change	Type of Action	Purpose
1.	Taking coup (July, 1977)	Constitution suspended	Imposed martial law and civilian government dethroned
2.	The Formation of a body by the Council of Islamic Ideology (November, 1977)	The establishment of an organisation	To formulate recommendations for the Islamisation Programme
3.	Empowering Supreme Court to Declare Un-Islamic Laws null and void (January, 1978)	Ordinance	To Islamize the laws
4.	New Education Policy (October, 1978)	Ordinance	To enhance the Islamic principles in education based on the Islamic Ideology
5.	Enforcement of Islamic Laws regarding rape, adultery and Prohibition of Wine (December, 1978)	Hudood Ordinance	To transform the punishments for these crimes with those prescribed in Islamic Sharia
6.	The Establishment of Sharia Benches in Superior Courts (February, 1979)	Ordinance	To deal the cases in courts according to the laws in Sharia
7.	More Islamic Laws for Murder, Theft and Robbery (December, 1979)	Ordinance	Again, to transform the punishments for these crimes with those prescribed in Islamic Sharia
8.	Zakat and Usher Ordinance and the Elimination of Usury (June, 1980)	Ordinance	To empower the government to deduct 2.5% Zakat annually from mainly interest-bearing saving accounts and shares schemes
9.	The Establishment of the Federal Sharia Court (May 1980)	Ordinance	To examine and decide the question whether or not any law or provision of law is repugnant to the injunctions of Islam
10.	Interest-Free Accounts in Banks (January, 1981)	Ordinance	To allow Pakistan's all nationalised commercial banks to offer profit/loss sharing accounts
11.	Provincial Constitutional Order (March, 1981)	Ordinance	The order provides for the appointment of a federal council (Majlis-i-Shoora) consisting of such persons as President may, by order, determine. It was equivalent to Parliament in modern democratic systems
12.	Blasphemy Laws (1980, 1982, 1986)	Ordinances	To set the disrespect to Muhammad (PBUH), Ahl-e-Bait (family of the Prophet), Sahaba (companions of the Prophet) and Sha'ar-i-Islam (Islamic symbols) as offenses
13.	Article 58/2-B (November, 1985)	Constitutional amendment	To give the discretionary power to the President to dismiss the Prime Minister, the elected government or the Parliament
14.	Validation of the above Ordinances (November, 1985)	Constitutional Act, 1985 (8th Amendment)	All the above changes were passed by Majlis-i-Shoora (Parliament) and signed by the President

Source: Khan(2013).

Nevertheless, the basic purpose of the intervention was to achieve legitimacy for the dictator's government. To get the support of the main sect and its sub-sects in Pakistan, the then president, general Zia-ul-Haq had designed constitutional amendments based on the Hanafi'ite jurisprudence [Khan (2013)].

General Zia's intervention in the religious market was a situation of two-way religious rent-seeking behaviour. From the government party, Zia was lobbying to remain in the power undemocratically, which could not have been possible if the dominant religious player/sect was not supporting him. From the producer side, the relevant sect was trying to expand their religious share to the political, fiscal and judicial institutions and markets. Thus, the religious sect(s) exploited this opportunity by supporting the dictator in return for the constitutional amendments.¹⁸ Once again, main religious sect(s) colluded with the dictator to restrict the influence of competitive players (sects) in the market through legal interventions [Talbot (2009)].

6. HAZARDS OF GOVERNMENT REGULATIONS

This section discusses how religious amendments created a sense of confrontation among different religious sects. First, it examines how religious violence correlated with the amendments in the short run and transformed into sectarian violence in the medium term. Then, it explains, how sectarian violence is converted to terrorism between sects and within a sect in the longer period.

6.1. The Short Run Hazards

The immediate reaction in the religious market came from sects who do not follow Hanafi'ite jurisprudence. They strongly objected to the Zakat tax and argued that it is against their beliefs to have the state involved in the distribution of resources. They politically mobilised thousands of their customers/followers against government intervention. Although, Zia eventually withdrew and exempted those sect(s) from the Zakat, this event accentuated differences between the two main sects in Pakistan [Nasr (2000a)].

Followers of Jafari'ite school of thought were suspicious of the state patronisation and enforcement of a particular jurisprudence in the religious market, and came forward to protect their religious principles, norms and values. Nevertheless, government allied sect(s) strongly reacted to the government's exemption of some sect(s) from the Zakat tax. Their hardcore sub-sects targeted each others' religious processions, mosques, leaders and professionals. In reaction, both main sects of Pakistan created their respective militant groups. This reaction with the formation of radical militant groups, unfortunately, led to the competition on violence between competitive sects in the religious market. Initially, it was converted to the market of violence. Thus, the future outcomes were sectarian violence and terrorism [Jackson, *et al.* (2009)].

¹⁸In the 1977 general election, the three main religious parties had formed an alliance with six other parties. The alliance had secured only 36 seats out of 200. Again, the religious parties were unable to get *de jure* power in the parliament [PILDAT (2013)].

6.2. The Medium Term Hazards

The lobbying of the religious sects can be seen in the well-known case of the Hazoor Bakhsh vs. Federation of Pakistan, Pakistan Legal Decisions (PLD), 1981, Federal Sharia Court (FSC), 145. The FSC had ruled that the sentence of rajm (stoning to death) for zina (fornication) was repugnant to the injunction of the Sharia Law. The FSC pointed out that the term *Hadd* was used in the Qur'an in a sense of restrictions (bounds set by Allah). None of these mean a fixed penalty. The court added that it appears from the traditions of the Prophet (PBUH) and sayings of his Companions that the word *Hadd* was used in the sense of punishment and not the 'fixed punishment.'

The court judgment was rejected by the followers of Hanafi'ite school of jurisprudence. They turned down the FSC 'interpretation' as being contrary to the Sharia Law and the judges were accused of being ignorant of law, the Islamic scripture and jurisprudence. The sect(s) who were not satisfied with the decision, lobbied against the dictator through country wide riots and protests. It led to another constitutional amendment (President's Order 5 of 1981), which added three judges who were religious scholars and raised the number in the FSC bench to eight. The reason for the extra three judges was a direct consequence of complaints by the main sect of Pakistan [Lau (2004)].

Government intervened in the judiciary institution due to the threat of riots and protests from one of the major sects. General Zia had needed support of that sect for the political legitimisation, thus, he intervened and made amendments in the FSC. The regulation made the government once again non-neutral in the religious market. Both players, the religious sect and the government colluded to maximise rents from the collaboration. In the early 1980s, Zia needed support of the specific faction to get Jihadies in the Afghan War against the former Soviet Union¹⁹ and the religious sect(s) were struggling for their presence in formal institutions.

6.2.1. Religious Schools and Rent-Seeking

According to the Article 22(2) of the constitution, "In respect of any religious institution, there shall be no discrimination against any community in the granting of exemption or concession in relation to taxation." Although, there is no explicit word for the subsidy in the above statement, however, one can interpret that the government will not discriminate against any religious institution in the provision of public goods. If the government provides concessions, it must treat all sects equally. But it was not the case in Pakistan, where governments changed wordings in religious concessions.

In the 1980s, one of the initiatives of Zia's *Islamisation* was the promotion of madrassas,²⁰ especially of the Hanafi'ite school of thought, to get political

¹⁹ For instance, these religious groups had provided and trained enough personnel for the Jihad in Afghanistan, aimed at defeating communism with the support of the United States (US), the Kingdom of Saudi Arabia (KSA) and the United Kingdom (UK) [Khan (2013)].

²⁰ Pakistan's madrassas are traditionally linked with the vast network of religious schools that started in Baghdad in the beginning of the 11th century. The process of the multiplication of madrassas continued with the passage of time owing to differences of the interpretation of the teachings of Qur'an and Hadith. The basic structure and system of education are more or less the same. However, since the 11th century till the rise of capitalism, madrassas were like modern schools, where, apart from religious texts, science, philosophy, art, astronomy, etc., were taught to the students.

benefits.²¹ Moreover, sects of this school were looking for long term investment in the promotion of their religious product and ideology. To get the initial liquid capital, these sects and sub-sects turned to the dictator, Zia. Zia was also looking for an investment, which could give him long term return. Investment in the promotion of a specific belief provided him both short and long term returns and rents.

Firstly, he successfully prolonged his undemocratic regime, and secondly, he used the return from religious investment as an instrument in his foreign policy in the Afghan War. Again, Zia kept aside Article 22(2) and intervened with his allies in the religious market. The US, UK and the Persian Gulf monarchies of Saudi Arabia and the United Arab Emirates had supported him with financial resources. The government provided a share from allies' funds for the promotion and construction of madrassas, and also enabled Islamic parties, social groups and religious scholars to do the same [Nasr (2000a)]. Since the 1980s, most of these madrassas became notable recipients of the Zakat funds that the government had collected. In 1984, for instance, 9.4 percent of the Zakat funds went to the support of religious schools, benefiting 2,273 madrassas and 111,050 students [Malik (1989)].

6.2.2. Rent-Seeking and Violence

At the end of 1979, the Soviet Union attacked Afghanistan. Few years later, Zia with the financial support of the US, UK and Arab monarchs intervened in the religious education market and supported religious schools. However, Zia linked the distribution of foreign rents to the provision of foot soldiers and sleeping cells to Afghan fighters who were fighting against the Soviet army. Therefore, the number of players in the religious market increased to three. The rent-seeking players were the hardcore sect(s), government (dictator) and foreign allies. Murphy (2012) argued that the rapid growth in madrassas during the Zia's regime led to the decline in the standard of training and scholarship.²²

A major proportion of the state and allies' funding went to specific hardcore sect(s) madrassas [Murphy (2012)]. The concession created a three way rent-seeking activity and every party took its share. The international players achieved their share of rent when the Soviet Union was pushed back by Afghan fighters, which led to the collapse of communism [Reuveny and Prakash (1999)]. Zia's government received external legitimacy and financial assistance from his allies in the form of grants, aid and loans. Between 1972 and 1999, 48 percent of total US aid was given to Zia [USAID (2014)]. The religious player received unprecedented investment in madrassas, students

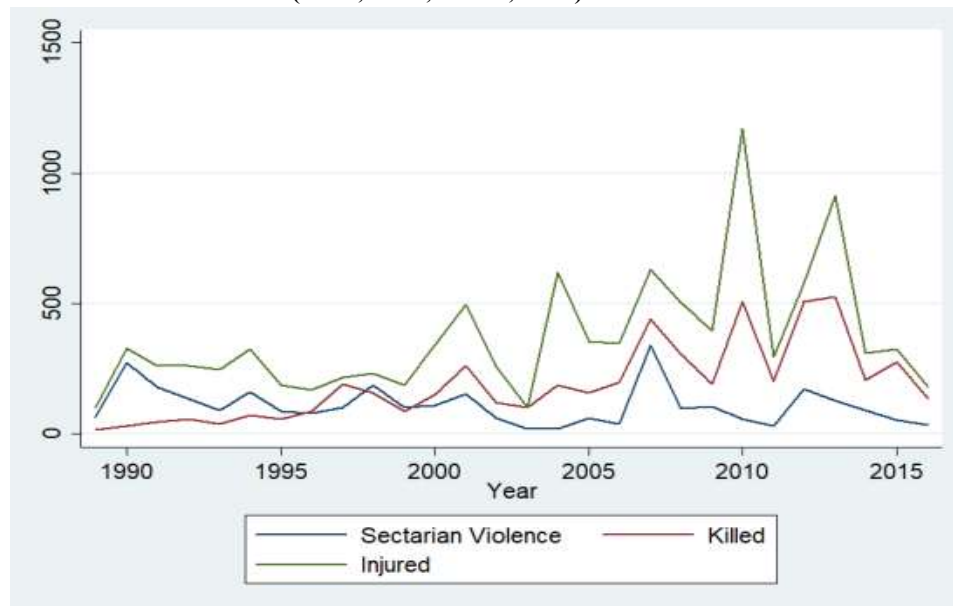
²¹Khan (2013) studied that Zia became the key ally of the US in the Afghan war. The West, especially the US and the Arab countries were against the Soviet Union's occupation of Afghanistan. Khan (2013) further explained that *Islamisation* helped Zia in attaining domestic legitimacy through the support of religious groups where the clergies allowed to initiate and conduct *Jihadi activities whole heartedly*. However, Zia's Islamisation policy had already started in November, 1977, while the Soviet Union had entered into Afghanistan on December 24, 1979 (see Table 2). Therefore, in our view, Zia's *Islamisation* was to get domestic legitimacy through the support of religious groups, not through support for the Jihad.

²² There were only 900 madrassas in 1971 in Pakistan, but increased to 33,000 (8,000 registered and 25,000 unregistered) by the end of Zia's era in 1988. One of the consequences of the large number of madrassas, especially the unregistered ones, was that they were strongly divided along sectarian rather than intellectual lines [Murphy (2012)].

and followers. The rent-seeking activities on the part of the three players created a social cost in the form of sectarian violence. Someone had to internalise this cost. Therefore, the citizens of Pakistan were exposed to the hazards of interventions.

With the withdrawal of Soviet troops from Afghanistan [The Geneva Accord (1988)], these hardcore sects who had accumulated financial and human resources went behind another competitor in the market. Since it was not possible to stop the competitor through legal rules (this school constitutes 15-20 percent of the population [Zaman 1998]), they turned into violence and effectively utilised its past investment in madrassas against that school.²³ Consequently, these organised sects started to compete in the production of violence rather than in moral standards and values. In the Zia's regime, almost every sect invested heavily in militant trainings. Figure 1 shows the increase in the production of sectarian violence immediately after Zia's rule. Unfortunately, we have little information available on sectarian violence during Zia's period and this is limited to a specific province. However, theologians, historians and political scientists concluded that sectarian violence is produced by Zia's interventions [Zaman (1998); Nasr (2000b); Stern (2000); Grare (2007); Asal, *et al.* (2008); Fair, *et al.* (2010, 2013) to mention a few].

Fig. 1. Sectarian Violence in Pakistan, 1989–2016
(PIPS, 2014; SATP, 2014)



6.3. The Long Term Hazards: Terrorism

Before 1979, there were 30 religious organisations of different denominations in Pakistan. After the Zia's Islamisation amendments, a sharp increase in the growth of the religious organisations was observed. The number rose to 239 in 2002 [Rana (2011)].

²³Most of the Jihadi organizations were established in the 1980s, the era dominated by Zia's regime Howenstein (2008)].

These figures take into account organisations at the national, regional and provincial levels. The number approaches to thousands if small local groups are considered as well.²⁴ Among the 239 organisations, 24 participated in electoral politics, 148 worked purely on the sectarian agenda, 24 became associated with the militant jihad, 12 were striving for the establishment of the renewalist/Khalifat movement and shunned democratic dispensations, 18 pursued missionary work, mainly preaching their sectarian ideas and 10 operated as charities [Rana and Ansari (2006)].

Zia's investment in different sects provided them enough human resources to challenge, not only competitive sects but also sub-sects of own jurisprudence and even the government. A militant group (Tehrik-i-Taliban Pakistan) converted initially into violent religious organisation, and gradually achieved a monopoly in violence. Their main objective is to capture the religious market through the production of extremism and violence. Figures 1 and 2 show sectarian and terrorism incidents in Pakistan. The extremists not only targeted their competitive sects but also sub-sects of their own jurisprudence. Over time, they diversified their targets from opposite sects to their own sect(s).

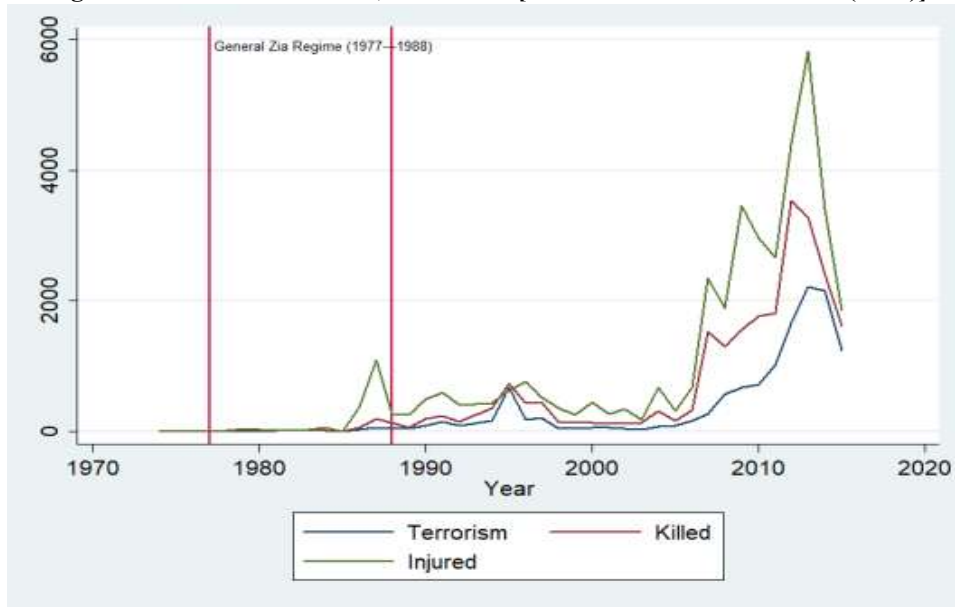
Due to political instability in the 1990s, government was unable to fully internalise the negative externalities which were created by the Zia's interventions. To control the spillover effect of 1980s policies, the Anti-Terrorism Act, 1997 was a major step forward in efforts to deal with the menace of terrorism.²⁵ Nevertheless, the religious market was so polarised at the end of the 1990s that mere laws were not enough to control the social costs of sectarian violence and terrorism. Although, there are divergences among the objectives of religious, political, sectarian, militant and charitable organisations, the commonalities play a significant role in shaping the religious discourse in the country. All sects and sub-sects are part of a single discourse and share common objectives. Their discourse encourages Islamisation and religiosity in society. These commonalities have led to the demand for the Sharia law (based on a narrow interpretation) by extreme violent and terrorist groups in Pakistan. For example, Tehrik-i-Taliban Pakistan (TTP)'s main objective and ideology was the enforcement of the Sharia based on its own narrow jurisprudence, which was also one of its main conditions in the peace negotiation with the government.²⁶

²⁴There is a trend in Pakistan that every big mosque or madrassa has its own religious organisation. They are mainly set up to gain influence in the area, collect donations and organise religious congregations. They often formally or informally merge and support the mainstream polity at the regional and national level which is in line with their schools of thought.

²⁵The Preamble of the Anti-Terrorism Act state, "Whereas it is expedient to provide for the prevention of terrorism, sectarian violence and for speedy trial of heinous offenses and for matters connected therewith and incidental thereto."

Section 6 of that Act defined a 'terrorist act' in the following terms: "Whoever, to strike terror in the people, or any section of the people, or to alienate any section of the people or to adversely affect harmony among different sections of the people, does any act or thing by using bombs, dynamite or other explosive or inflammable substances, or fire-arms, or other lethal weapons or poisons or noxious gases or chemicals or other substances of a hazardous nature in such a manner as to cause, or to be likely to cause the death of, or injury to, any person or persons, or damage to, or destruction of, property or disruption of any supplies of services essential to the life of the community or displays fire-arms, or threatens with the use of force public servants in order to prevent them from discharging their lawful duties commits a terrorist act."

²⁶Interested readers can find the objectives and ideologies of different extremist and terrorist groups at SATP (2014).

Fig. 2. Terrorism in Pakistan, 1974–2015 [Global Terrorism Database (2016)]

7. DISCUSSION AND CONCLUSION

This paper uses a market framework to analyse the implications of government regulations in the religious market of Pakistan. It defines a set of commodities which is available to customers in the religious market. The set includes both goods and services, i.e., rituals and prayers, financial markets and judicial institutions, monetary and fiscal policies, property rights and contract enforcement, etc. The religious product is differentiated on the basis of different interpretations of the Islamic jurisprudence. The commodity of one sect is an imperfect substitute for the comparative denomination. Producers in the market are different religious organisations and institutions which follow a specific interpretation to produce their products. Consumers are the general public who possess religious preferences and demand commodities which satisfy their religious taste. The price of a religious product includes the opportunity cost of time, that is, energy and resources used during the transaction and consumption processes.

This analysis shows that an oligopolistic structure exists in the religious market of Pakistan. This oligopoly is based on different religious denominations which coexist in the market. The number of sects and sub-sects are increasing over space and time. To be specific, oligopoly firms compete over the provision of mosques and madrassas to attract more followers. Due to the oligopolistic structure, the market forces are not efficient to provide different religious commodities including the collection and distribution of Zakat, and provision of interest free loans. Thus, government regulated the religious market over the years to provide certain religious products.

The study concludes that the appropriation of rent by the three players—the federal government, religious sects and cold war allies of Pakistan—played a significant role in the interventions of the religious market. From the government side, domestic legitimacy for a political governance was the main factor to back the regulations in the religious market.

Both democratic and non-democratic regimes tried to strengthen the domestic legitimacy of their respective governments, thus limiting these regulations to Hanafi'ite jurisprudence. The sects of this school received rents in the form of investment in their madrassas, mosques and congregations in return for support of the government in the cold war. Lastly, foreign allies provided funds for investment in the religious market to utilise the return against the former Soviet Union invasion in Afghanistan. Over time, the regulations delivered returns to the relevant players of the market, i.e., government, religious sect(s) and international allies. However, they created a social cost to be borne by the society.

The social costs include riots and violent protests, sectarian violence, and terrorist attacks. Over the years, the divisions among different sects have deeply polarised with the ensuing competition in the production of violence against each other. This non-price negative competition still exists in Pakistan and is intensifying over space and time. Nevertheless, few hardcore sects dominated over others in the production of violence [Global Terrorism Database (2016); SATP (2014)].

The main contribution of this paper is an alternative explanation of the prevailing sectarian conflict and terrorism in Pakistan from the religious market perspective. In this context, the study discussed the structure of the religious market and the incentives and probable consequences of the government interventions in it. Furthermore, it analysed that how demand and supply of the religious product(s) interact in the religious market. Similarly, it defined the price of the traded religious product(s) from the opportunity cost perspective; nevertheless, further research is needed on price determination and its mechanism in the Islamic religious market.

REFERENCES

- Abbas, H. (2004) *Pakistan's Drift into Extremism: Allah, the Army, and America's War on Terror*. ME Sharpe.
- Anderson, G. M. (1998) Mr. Smith and the Preachers: The Economics of Religion in the Wealth of Nations. *The Journal of Political Economy* 1066–1088.
- ARDA (2014) Quality Data on Religion @Online: <http://www.thearda.com/>.
- Asal, V., C. C. Fair, and S. Shellman (2008) Consenting to a Child's Decision to Join a Jihad: Insights from a Survey of Militant Families in Pakistan. *Studies in Conflict and Terrorism* 31:11, 973–994.
- Azam, J.-P. and A. Delacroix (2006) Aid and the Delegated Fight Against Terrorism. *Review of Development Economics* 10:2, 330–344.
- Azam, J.-P. and V. Thelen (2008) The Roles of Foreign Aid and Education in the War on Terror. *Public Choice* 135:(3-4), 375–397.
- Bainbridge, W. S. and R. Stark (1987) *A Theory of Religion*. New York: P. Lang.
- Barro, R. J. and R. M. McCleary (2005) Which Countries have State Religions? *The Quarterly Journal of Economics* 120:4, 1331–1370.
- Basten, C. C. and F. Betz (2013) Beyond Work Ethic: Religion, Individual and Political Preferences. *American Economic Journal: Economic Policy* 5:3, 67–91.
- Benjamin, D. J., J. J. Choi, and G. W. Fisher (2010) Religious Identity and Economic Behavior. National Bureau of Economic Research. (Technical Report).
- Blomberg, S. B. and G. D. Hess (2005) The Lexus and the Olive Branch: Globalisation, Democratisation and Terrorism. *Democratisation and Terrorism*.

- Boudreaux, D. J. (1989) Imperfectly Competitive firms, Non-price Competition, and Rent Seeking. *Journal of Institutional and Theoretical Economics* 597–612.
- Burgoon, B. (2006) On Welfare and Terror Social Welfare Policies and Political-economic Roots of Terrorism. *Journal of Conflict Resolution* 50:2, 176–203.
- Cipriani, L. (1993) Gender and Persecution: Protecting Women under International Refugee Law. *Geo. Immigr. LJ* 7, 511.
- Coase, R. H. (1974) The Market for Goods and the Market for Ideas. *The American Economic Review* 64:2, 384–391.
- Dehejia, R., T. DeLeire, and E. F. Luttmer (2007) Insuring Consumption and Happiness through Religious Organisations. *Journal of Public Economics* 91:1, 259–279.
- El-Gamal, M. A. (2006) *Islamic Finance: Law, Economics, and Practice*. Cambridge University Press.
- Enders, W. and T. Sandler (2005) Transnational Terrorism 1968-2000: Thresholds, Persistence, and Forecasts. *Southern Economic Journal* 467–482.
- Eubank, W. and L. Weinberg (2001) Terrorism and Democracy: Perpetrators and Victims. *Terrorism and Political Violence* 13:1, 155–164.
- Fair, C. C., R. Littman, N. Malhotra, and J. N. Shapiro (2013) Relative Poverty, Perceived Violence, and Support for Militant Politics: Evidence from Pakistan. (Unpublished Paper).
- Fair, C. C., N. Malhotra, and J. N. Shapiro (2010) Islam, Militancy, and Politics in Pakistan: Insights from a National Sample. *Terrorism and Political Violence* 22:4, 495–521.
- Freytag, A., J. J. Krueger, D. Meierrieks, and F. Schneider (2011) The Origins of Terrorism: Cross-country Estimates of Socio-economic Determinants of Terrorism. *European Journal of Political Economy* 27, S5–S16.
- Global Security (2014) Globalsecurity.org @Online: <http://www.globalsecurity.org/military/world/pakistan/islam.htm>.
- Global Terrorism Database (2016) National Consortium for the Study of Terrorism and Responses to Terrorism (START) [data file]. Technical Report, Retrieved from <http://www.start.umd.edu/gtd>.
- Goldziher, I. (1971) *The ahir̄is; Their Doctrine and Their History: A Contribution to the History of Islamic Theology*. EJ Brill.
- Pakistan, Government of (2014) The Constitution of the Islamic Republic of Pakistan @Online: <http://www.na.gov.pk>.
- Grare, F. (2007) The Evolution of Sectarian Conflicts in Pakistan and the Ever-changing Face of Islamic Violence. South Asia. *Journal of South Asian Studies* 30:1, 127–143.
- Grim, B. J. and R. Finke (2006) International Religion Indexes: Government Regulation, Government Favoritism, and Social Regulation of Religion. *Interdisciplinary Journal of Research on Religion* 2.
- Gruber, J. and D. M. Hungerman (2006) The Church vs. the Mall: What Happens when Religion Faces Increased Secular Competition? National Bureau of Economic Research. (Technical Report).
- Haleem, I. (2003) Ethnic and Sectarian Violence and the Propensity Towards Praetorianism in Pakistan. *Third World Quarterly* 24:3, 463–477.

- Howenstein, N. (2008) the Jihadi Terrain in Pakistan: An Introduction to the Sunni Jihadi Groups in Pakistan and Kashmir. Pakistan Security Research Unit (PSRU), *Research Report 1*, 28-31.
- Hungerman, D. M. (2005) Are Church and State Substitutes? Evidence from the 1996 Welfare Reform. *Journal of Public Economics* 89:11, 2245–2267.
- Hussain, M. (2006) Take My Riches, Give me Justice: A Contextual Analysis of Pakistan's Honor Crimes Legislation. *Harv. JL and Gender* 29, 223.
- Iannaccone, L. R. (1992) Sacrifice and Stigma: Reducing Free-riding in Cults, Communes, and other Collectives. *Journal of Political Economy* 271–291.
- Iannaccone, L. R., R. Finke, and R. Stark (1997) Deregulating Religion: The Economics of Church and State. *Economic Inquiry* 35:2, 350–364.
- ICPVTR (2014) International Centre for Political Violence and Terrorism Research @Online: <http://www.pvtr.org/ICPVTR/>.
- Imran, R. (2013) Legal Injustices: The Zina Hudood Ordinance of Pakistan and its Implications for Women. *Journal of International Women's Studies* 7:2, 78–100.
- Jackson, R., E. Murphy, and S. Poynting (2009) *Contemporary State Terrorism: Theory and Practice*. Routledge.
- Jaffrelot, C. (2015) *Pakistan Paradox: Instability and Resilience*. Oxford University Press.
- Johnson, B. R., R. B. Tompkins, and D. Webb (2002) *Objective Hope: Assessing the Effectiveness of Faith-based Organisations: A Review of the Literature*. Center for Research on Religion and Urban Civil Society Philadelphia.
- Kennedy, C. H. (1992) Repugnancy to Islam: Who Decides? Islam and Legal Reform in Pakistan. *International and Comparative Law Quarterly*, 769–787.
- Kettell, B. (2011) *Introduction to Islamic Banking and Finance*. Volume 1. John Wiley & Sons.
- Khan, A. M. (2003) Persecution of the Ahmadiyya Community in Pakistan: An Analysis under International Law and International Relations. *Harv. Hum. Rts. J.* 16, 217.
- Khan, K. (2013) Distributive Consideration in Institutional Change: The Case of Zias Islamisation Policy in Pakistan. *Constitutional Political Economy* 24:2, 139–165.
- Krieger, T. and D. Meierrieks (2011) What Causes Terrorism? *Public Choice* 147:(1-2), 3–27.
- Krueger, A. B. and J. Maleck'ov'a (2003) Education, Poverty and Terrorism: Is there a Causal Connection? *The Journal of Economic Perspectives* 17:4, 119–144.
- Kurrild-Klitgaard, P., M. K. Justesen, and R. Klemmensen (2006) The Political Economy of Freedom, Democracy and Transnational Terrorism. *Public Choice* 128: (1-2), 289–315.
- Lai, B. (2007) Draining the Swamp: An Empirical Examination of the Production of International Terrorism, 1968-1998. *Conflict Management and Peace Science* 24:4, 297–310.
- Lau, M. (2004) The Independence of Judges under Islamic Law, International Law and the New Afghan Constitution. *Heidelberg Journal of International Law* 64:4, 917–927.
- Lau, M. (2007) Twenty-five Years of Hudood Ordinances—A Review. *Wash. and Lee L. Rev.* 64, 1291.

- Leeson, P. T. (2012) An Austrian Approach to Law and Economics, with Special Reference to Superstition. *The Review of Austrian Economics* 25:3, 185–198.
- Levin, J. (2010) Religion and Mental Health: Theory and Research. *International Journal of Applied Psychoanalytic Studies* 7:2, 102–115.
- Lipset, S. M. (1959) Some Social Requisites of Democracy: Economic Development and Political Legitimacy. *American Political Science Review* 53:1, 69–105.
- Malik, J., et al. (2007) *Madrasas in South Asia: Teaching Terror?* Routledge.
- Malik, S. J. (1989) Islamisation in Pakistan 1977-1985 the Ulama and their Places of Learning. *Islamic Studies* 28:1, 5–28.
- Maloney, M., A. Civan, and M. F. Maloney (2010) Model of Religious Schism with Application to Islam. *Public Choice* 142: (3-4), 441–460.
- McCleary, R. M. and R. J. Barro (2006) Religion and Political Economy in an International Panel. *Journal for the Scientific Study of Religion* 45:2, 149–175.
- Moj, M. (2015) *The Deoband Madrassah Movement: Countercultural Trends and Tendencies*. Anthem Press.
- Murphy, E. (2012) *The Making of Terrorism in Pakistan: Historical and Social Roots of Extremism*. Routledge.
- Mustafa, A. R. and M. Cheema (2008) From the Hudood Ordinances to the Protection of Women Act: Islamic Critiques of the Hudood Laws of Pakistan. *UCLA Journal of Near Eastern and Islamic Law* 2009, 09–55.
- Nasir, M., A. Ali, and F. U. Rehman (2011) Determinants of Terrorism: A Panel Data Analysis of Selected South Asian Countries. *The Singapore Economic Review* 56:02, 175–187.
- Nasr, S. V. R. (2000a) The Rise of Sunni Militancy in Pakistan: The Changing Role of Islamism and the Ulama in Society and Politics. *Modern Asian Studies* 34:01, 139–180.
- Nasr, V. (2004) Military Rule, Islamism and Democracy in Pakistan. *The Middle East Journal* 58:2, 195–209.
- Nasr, S. V. R. (2002) Islam, the State and the Rise of Sectarian Militancy in Pakistan. *Pakistan: Nationalism without a Nation* 85–114.
- Nasr, V. R. (2000b) International Politics, Domestic Imperatives, and Identity Mobilisation: Sectarianism in Pakistan 1979-1998. *Comparative Politics* 171–190.
- Nomani, F. and A. Rahnama (1994) *Islamic Economic Systems*. New Jersey: Zed Books Limited.
- Olds, K. (1994) Privatising the Church: Disestablishment in Connecticut and Massachusetts. *Journal of Political Economy* 102:2, 277–97.
- Palmer, M. and P. Palmer (2007) *Islamic Extremism: Causes, Diversity, and Challenges*. Rowman and Littlefield Publishers.
- Piazza, J. A. (2007) Draining the Swamp: Democracy Promotion, State Failure, and Terrorism in 19 Middle Eastern Countries. *Studies in Conflict and Terrorism* 30:6, 521–539.
- Piazza, J. A. (2008) Incubators of Terror: Do Failed and Failing States Promote Transnational Terrorism? *International Studies Quarterly* 52:3, 469–488.
- PILDAT (2013) Pakistan Institute of Legislative Development and Transparency @Online: <http://www.pildat.org/publications/publication/elections/First10GeneralElectionsofPakistan.pdf>.

- PIPS (2014) Pakistan Institute for Peace Studies (PIPS) [data file]. Technical Report, Retrieved from <http://www.san-pips.com/>.
- Plumper, T. and E. Neumayer (2010) The Friend of My Enemy is My Enemy: International Alliances and International Terrorism. *European Journal of Political Research* 49:1, 75–96.
- Polk, M. F. (1997) Women Persecuted under Islamic Law: The Zina Ordinance in Pakistan as a Basis for Asylum Claims in the United States. *Geo. Immigr. LJ* 12, 379.
- Posner, R. A. (1987) The Law and Economics Movement. *American Economic Review* 77: 2, 1–13.
- Powell, R. (2009) Zakat: Drawing Insights for Legal Theory and Economic Policy from Islamic Jurisprudence. *Pitt. Tax Rev.* 7: 43.
- Punjab Police (1979) The Punjab Police, Pakistan @Online: <http://www.punjabpolice.gov.pk/download>.
- Quraishi, A. (1997) Her Honor: An Islamic Critique of the Rape Laws of Pakistan from a Woman-Sensitive Perspective. *Women of Faith: Muslim Women Scholar-Activitists in North America* (2000), Syracuse University Press.
- Rana, M. A. (2011) *Agenda of Religious-Political Organisations*. Pak Institute for Peace Studies.
- Rana, M. A. and S. Ansari (2006) *A to Z of Jehadi Organisations in Pakistan*. Mashal.
- Reuveny, R. and A. Prakash (1999) The Afghanistan War and the Breakdown of the Soviet Union. *Review of International Studies* 25:4, 693–708.
- Riedel, B. O. (2012) *Deadly Embrace: Pakistan, America, and the Future of the Global Jihad*. Brookings Institution Press.
- Rehman, F. U. (2015) *Essays on the Law and Economics of Terrorism in Pakistan* (Doctoral dissertation, alma).
- SATP (2014) South Asia Terrorism Portal (SATP) [data file]. Technical Report, Retrieved from <http://www.satp.org/>.
- Shahbaz, M. (2013) Linkages between Inflation, Economic Growth and Terrorism in Pakistan. *Economic Modelling* 32, 496-506.
- Sherkat, D. E. and J. Wilson (1995) Preferences, Constraints, and Choices in Religious Markets: An Examination of Religious Switching and Apostasy. *Social Forces* 73: 3, 993–1026.
- Smith, A. (1845) *An Inquiry into the Nature and Causes of the Wealth of Nations*. Nelson.
- Stern, J. (2000) Pakistan's Jihad Culture. *Foreign Affairs* 115–126.
- Stewart, J. (2012) Pakistan: A Hard Country. *Asian Affairs* 43:1, 144–145.
- Talbot, I. (2009) *Pakistan: A Modern History*. Hurst.
- USAID (2014) United States Agency for International Development @Online: <https://eads.usaid.gov/gbk/>.
- Vogel, F. E. and S. L. Hayes (1998) *Islamic Law and Finance: Religion, Risk, and Return*. Volume 16. Brill.
- Waseem, M., T. Kamran, M. A. Ali, and K. Riikonen (2010) Dilemmas of Pride and Pain: Sectarian Conflict and Conflict Transformation in Pakistan.

- Weaver, K. M. (2006) Women's Rights and Shari'a Law: A workable Reality—An Examination of Possible International Human Rights Approaches Through the Continuing Reform of the Pakistani Hudood Ordinance. *Duke J. Comp. & Int'l L.* 17, 483.
- Yang, F. (2010) Oligopoly Dynamics: Consequences of Religious Regulation. *Social Compass* 57:2, 194–205.
- Zaman, M. Q. (1998) Sectarianism in Pakistan: The Radicalisation of Shi'i and Sunni Identities. *Modern Asian Studies* 32:3, 689–716.

Political and Economic Uncertainty and Investment Behaviour in Pakistan

AHSAN ABBAS, EATZAZ AHMED, and FAZAL HUSAIN

This study analyses the effect of political stability and macroeconomic uncertainty on aggregate investment behaviour in Pakistan over the period 1960–2015. The Auto-Regressive Distributed Lags (ARDL) methodology is applied to explore both the long-run equilibrium relationship and short-run behaviour of investment. The macroeconomic uncertainty variable is derived from real exchange rate and is computed by the best-fitted GARCH model. The results reveal robust effects of political stability and macroeconomic uncertainty on overall investment activity in Pakistan. The government nationalisation policy, GDP growth, user cost of capital, credit availability and degree of openness are found to be the other key determining factors for investment both in long- and short-run. However, the favourable impact of physical infrastructure on investment holds in long-run only, while its effect is adverse though insignificantly in short-run. The findings support the neoclassical flexible accelerator principle and are consistent with economic theory. The volume of available funds is the binding constraint for investment and the McKinnon-Shaw hypothesis is validated in the short-run.

Keywords: Aggregate Investment, Irreversibility, Macroeconomic Uncertainty, Political Stability, GARCH, ARDL, Bound Testing Approach, Pakistan

1. INTRODUCTION

The existing theoretical and empirical literature suggest that investment is influenced by three categories of factors, which are anticipated future demand, past decisions and current market opportunities [Lucas and Prescott (1971)]. In the perspective of anticipated future demand, Jorgenson (1971, p. 1142) claimed that consideration of uncertainty in modelling and empirical analysis is the most important challenge. Uncertainty is classified into macroeconomic uncertainty, which could be the outcome of fluctuations in macro variables like GDP, CPI, exchange rate, etc. and political instability like civil conflicts, bad governance; unstable governments, etc. [see Knight (1921); Feng (2001); Le (2004)].

It is generally presumed that uncertainty (both macroeconomic and political) may have adverse effects on investment. Abdelkader (2017) postulates that investors are averse towards investing in a country characterised by economic uncertainty and political

Ahsan Abbas <ahsan_abbas32@yahoo.com> is Senior Research Fellow, Centre of Excellence for CPEC, Islamabad. Eatzaz Ahmed <eatzaz@qau.edu.pk> is Professor, State Bank of Pakistan (SBP) Memorial Chair, Quaid-i-Azam University, Islamabad. Fazal Husain <fazal@pide.org.pk> is Joint Director, Pakistan Institute of Development Economics, Islamabad.

Authors' Note: The paper is based on PhD thesis of principal author.

instability. The phenomenon of uncertainty is even more pronounced in developing countries like Pakistan due to the vulnerable economic conditions and political upheavals. The effect of political instability may be more visible because most investment decisions in a country like Pakistan are not taken on economic grounds but on an opportunistic and public choice basis [Haque (2007)].

Investment is irreversible in nature and thus involves an inherent delaying factor [Dixit and Pindyck (1994)]. Once capital is installed, it has little or no value unless used for the intended production and this makes investment sensitive to risk or uncertainty [Pindyck (1993)]. Irreversibility coupled with uncertainty makes potential investors reluctant to invest, which results in sub-optimal levels of investment. Hence, irreversible investment (that generates sunk cost) and delaying (wait and see) policy are linked with uncertainty, which consequently leads to inefficiency because of high cost of doing business. Furthermore, investors delay their investment decisions in the wake of unstable political environment and prefer to wait for improved and stable political conditions.

At the micro level, firms' investment decisions can be delayed in the presence of sunk costs, political instability and uncertainty about future cash-flows and unprofitable business opportunities. However, at macro level, 'raised business costs' are the channel of uncertainty. The issue of investment-uncertainty nexus is, therefore, a realistic phenomenon in modelling investment behaviour at macro level too, especially in the context of developing economies. Macroeconomic uncertainty matters a lot in investment decisions because if economic conditions are uncertain, potential investors do not have expectations of growth in demand and, hence tend to shy away from taking the risk of incurring huge sunk costs in case demand does not grow. Similarly, political instability/uncertainty also imposes unexpected costs on investment because it creates the risk of unexpected changes in economic policies, especially the structure of taxation and other fiscal and monetary policy measures that can directly or indirectly affect cost-benefit aspects of investment decisions.

The current body of evidence suggests various measures of uncertainty and irreversibility depending upon the data type, nature of the analysis (such as aggregated vs. disaggregated and macro vs. micro analysis etc.) and size of the economy. Macroeconomic uncertainty has been measured using inflation, real exchange rate and interest rate proxies, which have an adverse effect on capital formation [see Aryeetey (1994); Pattillo (1998)]. Moreover, different measures have been employed for quantifying uncertainty, such as unconditional variance, standard deviation, standard deviation of residuals of AR process and conditional volatility generated through an estimated GARCH model. In some cases, the percentage rate of change in inflation has also been used as a measure of uncertainty.¹ Unconditional variance or standard deviation may be used as a proxy for risk but not for uncertainty. Notably GARCH process seems more relevant and it is considered to be relatively more reliable proxy for uncertainty [see Darrat and Hakim (2000); Arize, *et al.* (2000)].

Investment activity in Pakistan has gone through various phases over the past sixty years as the country has a long history of macroeconomic and political uncertainty. Economic uncertainty has been partially caused by global factors like oil price shocks (during 1970s and 1990s) and commodity price shocks (2007-09). Another source of

¹See Ahmad, *et al.* (2008); Ahmad and Qayyum (2008, 2009).

economic instability has been internal factors like debt crisis of 1990s, when rupee continued to lose its value against US dollar, and major variations in monetary and fiscal policy stances and structural reforms under the IMF adjustment programmes. Pakistan also faced spells of political instability. For example, four democratically elected governments between 1988-99 were dislodged prematurely, on one pretext or the other. During this period investment activity mostly remained sluggish. In the context of this background it is important to explore to what extent economic and political uncertainties have hampered investment activity in Pakistan, while accounting for other (conventionally considered) determinants of investment behaviour.

A few studies have probed the aggregate investment and uncertainty nexus by making use of different measures of uncertainty. However, to our knowledge, no study has captured the effect of uncertainty (measured through conditional variance, i.e., GARCH) coupled with political instability on aggregate gross fixed investment for the Pakistan economy. The present study attempts to fill this gap by analysing the effect of macroeconomic uncertainty and political stability and investment in Pakistan over the period 1960–2015. The study uses a GARCH model to calculate macroeconomic uncertainty variable through real exchange rate, while polity score is used as a proxy for political instability. ARDL technique is employed to estimate the investment behaviour under uncertainty. Figure 1 (a and b) shows that investment growth and the proposed measure of macroeconomic uncertainty tend to move over time more-or-less in opposite directions indicating negative relationship of investment with macroeconomic uncertainty. On the other hand, the relationship between investment growth and political stability (opposite of uncertainty) is positive but weak.

The paper is comprised of six sections. Section 2 presents a review of literature, while theoretical background of the model is discussed in Section 3. Section 4 outlines the data used, construction of variables, research methodologies and models. Moreover, estimates of the parameters are discussed in this section. The main results and finding of the empirical analysis are presented in Section 5. The final section gives concluding remarks and outlines the policy implications of this analysis.

2. REVIEW OF LITERATURE

The recent strand of literature on investment behaviour mainly focuses on the issues of risk, irreversibility and uncertainty. The issue of irreversibility of investment and role of risk/uncertainty in determination of investment has gained attention in the literature from the late 1980s [for example, see Bernanke (1983); McDonald and Siegel (1986); Bertola and Caballero (1994); Belanová (2014)]. The classical theory of real options postulates that uncertainty dampens investment activity [Antoshin (2006)]. The literature, in general, demonstrates negative impact of irreversibility and uncertainty on investment [Lee and Shin (2000); Carruth, *et al.* (2000)]. It is pertinent to note that evidence about the impact of uncertainty has been found positive as well and so investment-uncertainty relationship is inconclusive in terms of its impact and intensity [Abel, *et al.* (1996); Patnaik (2016); Lee (2016)].

The micro or firm-level studies mostly analyse issues of irreversibility, option value and delays in investment decisions. In the context of irreversibility, Majd and Pindyck (1987) demonstrate that uncertainty may possibly increase the required return to

a great extent due to considerable delays in delivery and installation of new capital. The literature on the issue has examined the implications of irreversibility for investment-uncertainty relationship [see Caballero and Pindyck (1992); Pindyck and Solimano (1993)]. It is argued that the threshold level of required profit increases along-with uncertainty; hence less is invested at higher levels of uncertainty.

In their pioneering work on investment in an uncertain world, Dixit and Pindyck (1994) explain how option pricing theory can be utilised to gain insights into the irreversible investment behaviour facing demand and price uncertainty. The study indicates that investors use the 'wait and see' policy prior to undertaking investment in the presence of uncertainty. This implies that a higher level of uncertainty leads to lower levels of investment. Using panel data of 772 US manufacturing firms Leahy and Whited (1996) examine the linkages between investment and uncertainty during the period 1981–1987 and find that uncertainty negatively causes investment. However, Parker (2010) points out that even in micro-level surveys of investment, the impacts of irreversibility are hard to observe. The study further elaborates that it can be implied from testable effect of irreversibility that the increase in uncertainty affects investment negatively through raised option cost of investment.

In a recent analysis of business investment, Belanová (2014) explore the impacts of uncertainty and irreversibility as determining factors of investment. The study finds that interaction between these variables may create opportunity costs and application of corresponding (real) option and the prevalent conditions pertaining to market structure and institutional setup in volatile economies of developing countries are more prone to the issue of uncertainty. The study concludes that the inverse relationship between uncertainty and investment persists in the presence of irreversibility. According to Pindyck and Solimano (1993), uncertainty has robust negative influence on investment in the case of developing economies, but for the OECD countries the negative impact is not considerable. However, Ferderer (1993) finds that uncertainty negatively influences aggregate investment activity in the USA. Levine and Renelt (1992) reveal that even though inflation itself and its uncertainty do not have significant effect on investment, yet when linked with political uncertainty it may affect investment adversely.

Employing data of 14 African countries over the time span of 1980–1995, Bleaney and Greenway (2001) find that investment is significantly affected by exchange rate uncertainty, but not by terms of trade uncertainty. In a more comprehensive study based on data for 46 developing countries, Aizenman and Marion (1993) explore the effect of uncertainty on investment using a composite uncertainty index derived from the nominal money growth, ratio of government expenditures to GDP, and real effective exchange rate. The findings show a strong negative effect of volatility on private investment, a positive effect on public investment and no significant impact when private and public investments are analysed jointly. Similarly, Rozezi, *et al.* (2014) in the case of Iran finds that macroeconomic uncertainty affects the private investment negatively both in the short-run and the long-run; when macroeconomic uncertainty is proxied by inflation rate, nominal interest rate and real exchange rate.

Sioum (2002) identifies terms of trade volatility as the only macroeconomic uncertainty proxy out of four other measures that negatively and significantly influences private investment. However, Serven (1998) and Clausen (2008) find significant direct

relationship of investment with volatility of exchange rate. Aysan, *et al.* (2006) while analysing the traditional reasons of low investment for a panel of 39 countries of Middle East and North Africa region along-with economic uncertainty using several measures of volatility, conclude that deficient economic environment and the lack of economic reforms significantly erode private entrepreneurs' decision to invest.

The uncertainty measures used in both micro and macro level studies include variance, standard deviation and coefficient of variation of key variables in investment decision making. GARCH conditional variance, residuals of AR processes and future perception measures of variables of interest are often used as proxies of uncertainty [Pindyck (1986); Episcopos (1995); Price (1996); Ghosal and Loungani (1996); Pattillo (1998); Guiso and Parigi (1999); Bloom, *et al.* (2007); Belanová (2014)]. The variation in results across different studies are mostly due to use of the different measures and estimation techniques. Keeping in mind the Knightian and Keynesian viewpoints, risk is distinguished from uncertainty on the basis of unconditional or objective method versus conditional variances or subjective approach. In this context simple variance/standard deviation and residuals of AR processes (unconditional volatility) may be closely related measure of the risk whereas the GARCH based conditional volatility can be the relevant measure of uncertainty.

Coupled with (macro) economic uncertainty, volatile and unstable social and political situations may also hamper investment flows. In macroeconomic context Rodrik (1991) and Pindyck and Solimano (1993) show that political uncertainty tends to reduce the level of investment. The factors like weak institutions, fragile political structure, disobedience of rule of law, poor law and order conditions, corruption, riots, strikes, crime and frequent changes in political regimes are expected to affect the investment decisions [see Stewart and Venieris (1985); Sjaastad and Bromley (1997)]. Basically, socio-political uncertainty adversely affects investment due to a gloomy investment climate. It shatters business confidence and raises cost of doing business because property rights cannot be properly enforced. In particular, corruption results in inefficiencies, transaction costs and levy of new taxes, which all reduce investment activity in the economy [Mauro (1995); Murshed (2002)].

Using data of 60 countries, Brunetti and Weder (1997) study the effects of various measures of institutional uncertainty on investment over the period 1974–89. The study finds that different uncertainty measures are inversely related to investment and investment irreversibility magnifies the impact of uncertainty on investment decisions. In another major study using data of 48 countries, for the period 1980–2005, Julio and Yook (2012) analyse the influence of political uncertainty on corporate investment. The study finds that investment is reduced by 4.8 percent on average during election years when compared to nonelection years.

The existing empirical evidence supports the notion that political instability/uncertainty can adversely affect the aggregate investment level. The studies like Barro (1991) and Alesina and Perotti (1996) find correlation between cross-country differences in rates of investment and measures of violence and political instability. Moreover, the literature shows that aggregate investment expenditures are inversely related to political uncertainty as well as corruption and bribery [Pindyck and Solimano (1993); Mauro (1995)].

3. THEORETICAL UNDERPINNING OF THE ECONOMETRIC MODEL

Investment behaviour is inherently uncertain and should be modelled accordingly. Along-with conventional determining factors of investment like profitability, monetary and fiscal policy measures, etc., investment analysis incorporates the phenomena of animal spirits,² (business) expectations, timing of investment decisions and risk/uncertainty [Chirinko (1993); Temple, *et al.* (2001); Le (2004); Aysan, *et al.* (2006)]. The effects of uncertainty can be viewed in terms of uncertainties about future profitability and discount factors; lumpy and irreversible investment; linked and fixed adjustment costs; political instability; property rights problem, corruption, rent-seeking and opportunistic behaviour [Caballero (1999); Romer (2001); Le (2004)]. Caballero (1999) states the concept of 'reluctance to invest', which states that capital's marginal profitability should considerably outweigh its cost for the investment to take place. Reluctance reflects the value of 'option to wait'. In this case positive simple net present value (NPV) will not be the exclusive criterion to invest because of the pending decision for tomorrow and uncertain future. Therefore, in the context of value-maximising, simple NPV rule is not optimal in the presence of irreversibility and uncertainty [Ingersoll and Ross (1992)].

The present study uses the model of Le (2004) to construct an econometric model of aggregate investment behaviour for Pakistan under macroeconomic uncertainty and political instability. The model assumes a large number of economic agents with infinite life spans. They consume an amount (C) from the return on income allocated to investment in one period. For simplicity, investors are assumed to allocate their resources in a single (domestic) market. Additionally, there is no labour income. A single homogeneous good in the country is assumed. Finally, population is assumed to be constant and normalised to unity. Assuming that the representative agent maximises lifetime utility subject to the budget constraint, Le (2004) concludes that in spirit the investment decision under irreversibility and uncertainty are based on expected return and risk or uncertainty measured by (conditional or unconditional) variance of returns.

In the generalised aggregate model, aggregate investment is taken as dependent variable and expected return and measures of uncertainty (both political and economic) are the explanatory variables. Other control variables could also be included to effectively investigate the investment behaviour. In the presence of control variables the econometric model assumes the following form:

$$I = \alpha + Z\beta + X\gamma + \varepsilon \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad (1)$$

where I is the aggregate fixed investment,³ X is Vector of macroeconomic uncertainty and political instability and Vector Z includes the variables suggested by theoretical and empirical studies such as GDP growth (accelerator theory/principle),⁴ user cost of capital (neoclassical investment model of Jorgenson), financial development (credit availability),

² The Keynesian notion of 'animal spirit' describes the state of inability of economic agents to perceive the future outcomes who are unable to attach probabilities to the possible outcomes.

³ Many studies have used the real (private/total or aggregate/domestic) investment level rather than its ratio to output (GDP) or capital stock [for example, see Serven (1998); Bleaney and Greenway (2001); Badawi (2003); Ajide and Lawanson (2012); Hamuda, *et al.* (2013); Rozezi, *et al.* (2014); Akanbi (2016)]. However, Le (2004) has taken this variable as private investment to output ratio.

⁴ Sakr (1993) and Suhendra and Anwar (2014) have also used GDP growth (as a proxy) to empirically test the accelerator theory/model.

physical infrastructure and trade openness [for details, see Aysan, *et al.* (2006)]. Notably the literature suggests that investors' expectations about economic environment can be captured through one-year lagged GDP growth rate [Aysan, *et al.* (2006)].

Variation in the investment spending with changes in output can be referred to as the 'accelerator principle' and it indicates changes in demand [Naa-Idar, *et al.* (2012)]. The neoclassical model also suggests that increase in cost of capital/doing business makes some of the investment projects economically unfeasible and as a result overall investment expenditure declines [Hall and Jorgenson (1969); Akkina and Celebi (2002)]. The neoliberal framework of investment behaviour emphasises on the importance of financial deepening in encouraging investment [McKinnon (1973) and Shaw (1973)]. Contrary to neoclassical theory of investment, McKinnon and Shaw hypothesis suggests a positive impact of real rate of interest on the level of investment as higher interest rates can lead to an increase in savings and thus domestic credit available as investible funds. Similarly, financial development (bank credit) is also considered as the key determinant of investment. In developing countries due to underdeveloped financial markets, interest rate does not reflect the true cost of capital and the availability of financial resources rather than cost is a binding constraint. Availability of financial resources is captured by credit availability [Akkina and Celebi (2002)].

Trade openness means access to the latest technology [Hamuda, *et al.* (2013)]. Trade liberalisation reduces trade barriers and thus stimulates the export sector, resulting in improvement in the current account balance and increased investment incentives [Balassa (1988); Asante (2000); Naa-Idar, *et al.* (2012)]. Infrastructural development increases productivity of capital [Looney (1997)]; reduces the external (transaction) costs and hence boosts the rate of return [Asiedu (2002)]; and enlarges the market [Badawi (2003); Suhendra and Anwar (2014)].

The econometric model in its simple form to represent the relationship between investment and its determinants is given by:

$$I = \alpha_0 + \alpha_1 G + \alpha_2 UC + \alpha_3 FD + \alpha_4 OP + \alpha_5 PI + \alpha_6 GSD + \alpha_7 POL + \alpha_8 ND + \mu \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad (2)$$

where I , G , UC , FD , OP , PI , GSD , POL , ND denote aggregate fixed investment, real GDP growth rate, user cost of capital, financial development, trade openness, physical infrastructure, GARCH conditional standard deviation of real exchange rate, polity score and nationalisation dummy respectively.

4. DATA AND ESTIMATION METHODOLOGY

4.1. Data Description

The study analysis encompasses the time period 1960–2015. All the variables are extracted from *Pakistan Economic Survey (PES)*, *International Financial Statistics (IFS)*, *World Development Indicators (WDI)* online version, *Polity IV dataset* and *Penn World Table*. Real gross fixed capital formation i.e. aggregate fixed investment (I) is the dependent variable while real GDP growth (G), user cost of capital (UC), financial development (proxied by real domestic credit availability) (FD), trade openness (OP) and physical infrastructure (PI) are the major explanatory variables employed in the study. GARCH standard deviation of real

exchange rate⁵ represents macroeconomic uncertainty (GSD).⁶ Political stability (POL) is proxied by polity IV score. The lower value represents political instability and *vice versa*. To calculate polity score autocracy score is subtracted from the democracy score; with the resulting unified polity scale ranging from -10 (strongly autocratic) to +10 (strongly democratic). To capture the effect of nationalisation, dummy variable (DN) is used. The value of it is set equal to one for the years 1972-1974 and zero otherwise.

4.2. Construction of Variables

Data on all variables used in the analysis are expressed at constant 1999-2000 million Pakistan Rupees except user cost of capital, physical infrastructure and polity IV score. Monthly real exchange rate data are used to estimate GARCH standard deviations series. It is then converted into annual series by taking twelve month average for each year. Financial development variable (FD) is proxied by using total domestic credit availability. Physical infrastructure (PI) variable is proxied by road density (length of roads per square kilometer or area). Trade openness (OP) is computed by dividing the sum of exports and imports by GDP.

Hall and Jorgenson (1967) argue that decision of investment relies upon cost and benefit analysis. Benefit side largely depends upon demand, while cost relies on (change in) price of capital (the implicit investment deflator)/inflation rate,⁷ (nominal) interest rate and depreciation rate. According to Jorgenson, user cost (UC) of capital is represented by the following formula.

$$UC = P_k \left(i + \delta - \frac{\Delta P_k}{P_k} \right), \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad (3)$$

where the capital price P_k is approximated by (implicit) investment price deflator, i is average of three different nominal interest rates (call money rate, government bond yield and discount rate), δ is the depreciation rate,⁸ and last term $\Delta P_k/P_k$ shows the growth rate of capital price/inflation rate.⁹

4.3. Estimation Technique

Majority of macroeconomic time series variables, i.e., GDP, credit availability and road density are non-stationary; while some series may be stationary.¹⁰ The standard

⁵Real effective exchange rate (REER), in most cases, is a better indicator of actual competitive exchange rate. However, for developing countries this indicator has not been much of a help. In Pakistan's case during the fixed exchange rate regime the data on exchange rate was flat before 1982 with a few steps representing planned devaluation, rendering itself non-viable for econometric usage.

⁶The movements in real exchange rate occur due to inflation, government policies, country competitiveness and real variables of the economy. So, it captures the uncertainty originating from inflation uncertainty, and all other sorts of uncertainty [see Dornbusch (1976); Van Foreest and De Vries (2003)].

⁷See Akkina and Celebi (2002).

⁸The series is taken from *Penn World Table*.

⁹Capital has three costs to the firm namely forgone interest (iP_k), depreciation capital cost (δP_k), and change in the price of capital over time (ΔP_k). Note that probable change in the price of capital ΔP_k causes the increase in cost of using the capital due to the fall in price and vice versa. So, the corresponding cost is $-\Delta P_k$. The forgone interest and negative growth in the price of capital (inflation) i.e. real interest rate $r = \left(i - \frac{\Delta P_k}{P_k} \right) = > i - \pi$ is opportunity cost (of capital).

¹⁰Note that if all the variables in the analysis are non-stationary/integrated of order one (or same order) and their linear combination is stationary/error-correction i.e. co-integrated (existence of long-run relationship) then the r Engle and Granger (1987) or Johansen-Juselius (JJ) (1990) approach method can be applied. In case of small data and differing or mix order of integration, the ARDL technique of co-integration is used.

estimation techniques like OLS can, therefore, possibly produce spurious results.¹¹ Furthermore, endogeneity is another important issue present in many macroeconomic relationships, such as output and investment behaviour because of interdependence and inertia factor. In such a scenario, the OLS would yield biased and inconsistent estimates. The present study addresses these issues by employing the Auto-Regressive Distributed Lag (ARDL) approach outlined by Pesaran, *et al.* (2001). The advantage of ARDL approach is that it not only takes into account the endogeneity issue [Alam and Quazi (2003); Rehman, *et al.* (2009)], but it also does not require all variables to be stationary in first differences, allowing some of them to be stationary at level as well.

Pesaran and Shin (1999) show that in an ARDL model free of residual correlation, endogeneity is less of an issue and, therefore, choice of appropriate lags in the ARDL model is vital to ensure absence of residual correlation and tackling of endogeneity. Another advantage of ARDL method is that it estimates both the long-run and short-run responses in the variable under consideration, thereby addressing issues related with omitted variables and autocorrelation. Therefore, estimates provided by ARDL method are unbiased and efficient because of avoiding the problems caused by endogeneity and autocorrelation [Siddiki (2000)].

The main disadvantage of ARDL model is that it only allows for one-way relationship from all the regressors towards the focused variable (investment in our case). Given that investment is, by definition, a part of GDP, one wonders how GDP could be considered as exogenous in the system. However, we can justify the use of ARDL framework, keeping in view its advantages, on two grounds. First, the GDP variable is not represented in level form, rather in the form of year to year growth rate. Therefore, even though GDP itself cannot be treated as an exogenous variable, its growth rate could still be exogenous with respect to current investment expenditure. Second, preliminary data analysis (Granger causality tests) shows that causality from investment to GDP growth rate is rather weak, insignificant even at 20 percent level of significance, whereas causality from GDP growth rate to investment is statistically significant.

Using the standard ARDL framework, Equation (2) is generalised as follows.

$$\begin{aligned} \Delta I_t = & \alpha + \sum_{i=1}^{p_1} a_i \Delta I_{t-i} + \sum_{i=0}^{p_2} b_i \Delta G_{t-i} + \sum_{i=0}^{p_3} c_i \Delta UC_{t-i} + \sum_{i=0}^{p_4} d_i \Delta FD_{t-i} \\ & + \sum_{i=0}^{p_5} e_i \Delta OP_{t-i} + \sum_{i=0}^{p_6} f_i \Delta PI_{t-i} + \sum_{i=0}^{p_7} g_i \Delta GSD_{t-i} + \sum_{i=0}^{p_8} h_i \Delta POL_{t-i} \\ & + \gamma ND_t + \beta_1 I_{t-1} + \beta_2 G_{t-1} + \beta_3 UC_{t-1} + \beta_4 FD_{t-1} + \beta_5 OP_{t-1} \\ & + \beta_6 PI_{t-1} + \beta_7 GSD_{t-1} + \beta_8 POL_{t-1} + v_t \quad \dots \quad \dots \quad \dots \quad (4) \end{aligned}$$

The null hypothesis of joint restriction that all the parameters β_i s are equal to zero means non-existence of co-integrating relationship among the variables considered. This hypothesis is tested using F-statistic, wherein rejection of the null hypothesis would indicate existence of a co-integrating (long-run) relationship. The parameters a 's, b 's, c 's, d 's, e 's, f 's, g 's and h 's describe the short-run dynamics of the variables. Finally, v_t the residual term and it is assumed as white noise process. The estimates are subject to many econometric issues if the assumptions regarding the residual are violated. The diagnostic tests, therefore, consist of checking for autocorrelation, normality and heteroscedasticity of errors, Ramsey Reset test and the tests for stability of parameters based on CUSUM and CUSUMSQ test.

¹¹Granger and Newbold (1974) have suggested the rule of thumb that estimated results are spurious when the coefficient of determination (R^2) is larger than the Durbin Watson (DW) statistic of autocorrelation.

Multiple lag selection criteria such as Hannan Quinn Criterion (HQC), Akaike Information Criterion (AIC), Schwarz Bayesian Criterion (SBC), and adjusted R-square are used in ARDL approach. However, the present study mainly focuses on Schwarz Bayesian Criterion (SBC) as it selects the most parsimonious model [Quinn (1988); Morimune and Mantani (1995); Pesaran and Shin (1999)].

The ARCH and the GARCH models formulated by Engle (1982) and Bollerslev (1986), respectively are used to study volatility clustering and model uncertainty accordingly. Generally the GARCH model is specified in terms of two equations namely the conditional mean equation (ARMA), and conditional variance equation. For diagnostics of lag structure of both the mean and variance equations besides the study of autocorrelation structure of residuals and squared residuals, performance criteria like AIC, SBC, etc. are also employed.

It is important to note that besides ARDL and GARCH, to analyse the investment behaviour under uncertainty over time, Dynamic Conditional Correlation (DCC) and/or Copula models and Extreme Value Theory (EVT) methodology are also used in the studies to observe co-movement between uncertainty and investment behaviour [for details, see Nguyen and Bhatti (2012); Bhatti and Nguyen (2012); Al Rahahleh, *et al.* (2017)]. But Copula approach to study co-movement between uncertainty and investment (dependence between two random variables) does not seem to be feasible for the present study. The approach is usually applied to high frequency data [see Palaro and Hotta (2006); Righi and Ceretta (2012); Bob (2013); Al Rahahleh and Bhatti (2017)]. Various studies have also noted that the approach is hard/cumbersome and tricky and requires large samples [Palaro and Hotta (2006); Alexander (2008); Bob (2013)]. For example, Alexander (2008) and Bob (2013) suggest that historic sample should be sufficiently large to yield enough observations in the tail of the data distribution.

5. ESTIMATION RESULTS AND DISCUSSION

Firstly, macroeconomic uncertainty is measured by real exchange rate volatility through GARCH model. Appendix shows that according to unit root tests results the log of real exchange rate series is integrated of order one. Therefore GARCH model is considered with first difference of the log of real exchange rate (growth rate of real exchange rate). Before fitting the GARCH process, we have tested the presence of ARCH process (volatility clusters) using Lagrange Multiplier (LM) ARCH test [Engle (1982)] and serial correlation in using Ljung-Box Q-Stat. The results presented in Appendix confirm the presence of significant ARCH effects and serial correlation in data. For final model selection alternative specifications of GARCH model are run and the results are presented in Table 1. Based on the results of these specifications, GARCH (1,3) specification for variance equation along-with ARMA (2,3) specification for mean equation are considered to be appropriate using AIC, SBC and significant coefficient technique.

The effectiveness and efficiency of the selected GARCH process is verified by testing the residual term, which should follow the white noise process. If the residual term shows the properties of white noise then the selected model is appropriate. To test the residuals, two tests are applied i.e. LM ARCH test and serial correlation using Ljung-Box Q-Stat. The results presented in Appendix reveal that there is no ARCH and serial

correlation left in the residual at 5 percent level of significance, so residuals are white noise. After passing the diagnostic test the conditional variances are estimated and using 12 period averages they are converted into annual time series to be used in our main model as a measure of macroeconomic uncertainty.

Table 1
Estimates of Alternative GARCH Model

	ARMA(2,3)				ARMA(2,2)		
	GARCH (1,1)	GARCH (1,2)	GARCH (1,3)	GARCH (2,3)	GARCH (1,1)	GARCH (1,2)	GARCH (1,3)
ARCH(1)	0.001 (0.17)	0.002*** (0.06)	0.001* (0.00)	0.02** (0.04)	0.006 (0.15)	0.003** (0.03)	0.01** (0.03)
ARCH(2)				-0.01 (0.53)			
GARCH(1)	0.968* (0.00)	0.001 (0.98)	-0.80* (0.00)	0.41 (0.68)	0.89* (0.00)	0.004 (0.93)	-0.31* (0.00)
GARCH(2)		0.93* (0.00)	-0.39* (0.00)	0.02 (0.97)		0.925* (0.00)	0.31* (0.00)
GARCH(3)			0.47* (0.00)	0.01 (0.98)			0.88* (0.00)
AIC	-4.536	-4.540	-4.798	-4.503	-4.530	-4.537	-4.55
SBC	-4.483	-4.480	-4.732	-4.430	-4.484	-4.484	-4.494
Adj R ²	0.178	0.174	0.168	0.013	0.163	0.168	0.14

P-values are provided in the brackets.

The coefficients significant at 1 percent, 5 percent and 10 percent are indicated by *, ** and *** respectively.

Before presenting the results of ARDL model, it will be informative to observe the descriptive relationship of investment growth with the two uncertainty variables. Figure 1 shows that investment growth forms negative relationship with macroeconomic uncertainty and positive relationship with political stability (opposite to political instability or uncertainty).

Fig. 1.a. Investment Growth and Political Stability

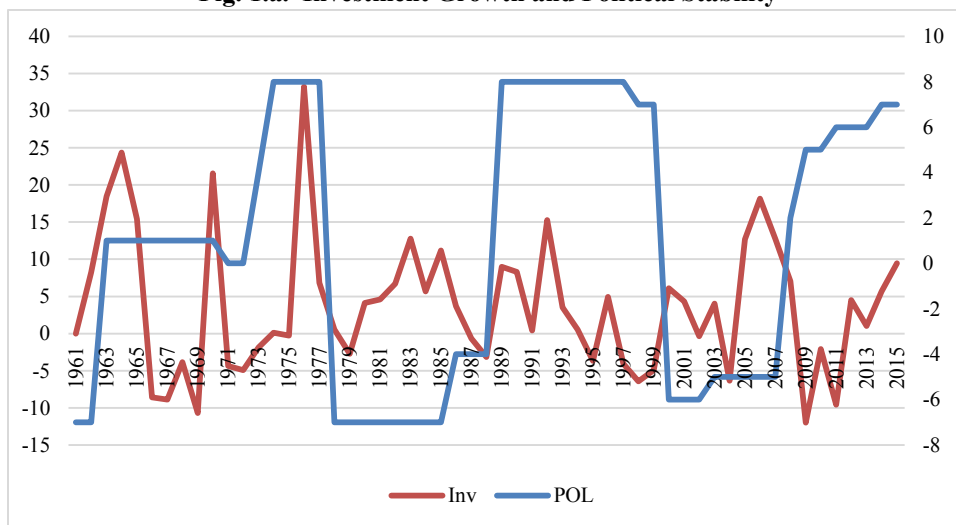
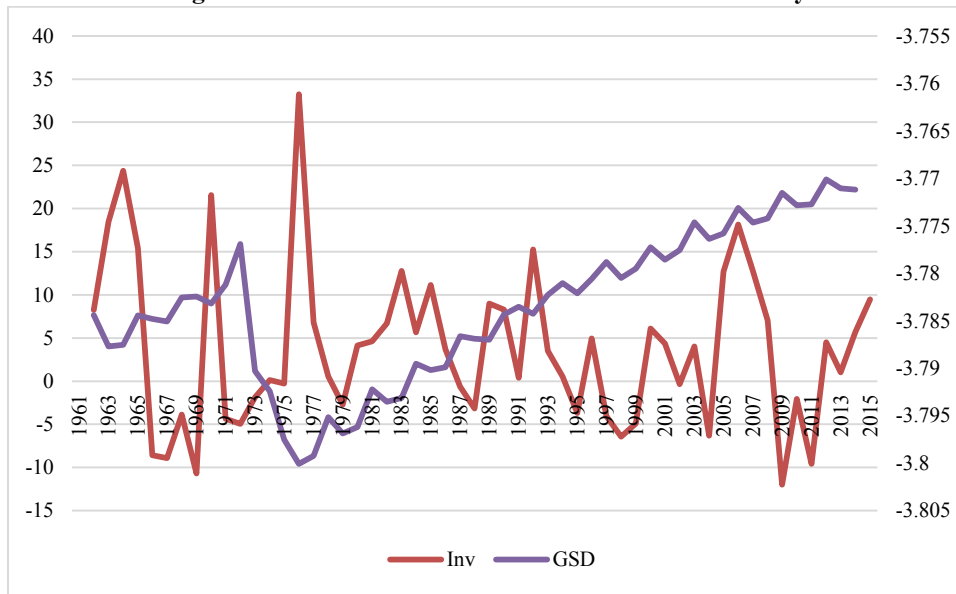


Fig. 1.b. Investment Growth and Economic Uncertainty

Moving now to the ARDL model, Augmented Dickey Fuller (ADF) and Phillips Perron (PP) unit root tests are applied to check the stationarity of the variables that enters into the model. The results presented in Appendix indicate that GDP growth rate, user-cost of capital, and trade openness are stationary at level whereas investment, real credit, economic uncertainty and political stability are integrated (process) of order one. Physical infrastructure variable has a very strong inertia, therefore it is de-trended before applying the tests. Based on Schwarz Bayesian Criterion (SBC) lag lengths of 4,0,3,4,0,2,3 and 0 are selected for investment, GDP growth, user cost, financial development, trade openness, physical infrastructure, GARCH conditional standard deviation and polity score respectively.

Since reliability of the estimated model depends on outcomes of diagnostic test, firstly discussion on these issues is provided and the results are reported in Appendix. To confirm whether residuals follow white noise process and normality assumptions, serial correlation LM test for Autocorrelation, ARCH LM test for conditional heteroscedasticity, Jarque-Bera (JB) test for normality and Ramsey Reset test for model specification are applied. The test results presented in Appendix indicate that there is no serious econometric problem in regression residuals and model specification is appropriate. Finally, stability of parameters is assessed using CUSUM and CUSUMSQ tests. The corresponding graphs shown in Appendix indicate that parameter estimates are stable. The Adjusted R^2 is 0.993. Our model is, therefore, explaining 99.3 percent variations of the aggregate investment.

While fitting ARDL model, first of all, presence of long-run relationship is tested by “Bounds Test” and F-stat confirms presence of long-run relationship at 2.5 percent level of significance. The long-run and short-run relationships can also be confirmed through coefficient of error-correction (ECM) term. Table 2 indicates that the estimated value of this coefficient is -1.065 , which is almost in the middle of the desired range of -2 to 0 [Rafindadi and Yosuf (2013)]. The estimated value implies that on average

investment shock in any year are adjusting within the next year by slight overshooting. For example, if investment exceeds (falls short of) the equilibrium level by 100 billion rupees in any year then in the very next year investment expenditure will decrease (increase) by 106.5 billion rupees.

The results of the ARDL model are presented in Tables 2 and 3. The findings reveal that coefficients of majority of variables are significant in both long-run and short-run and are consistent with theory. Both the short-run and long-run coefficients of real GDP growth variable (G) are positive and highly significant, indicating that economic growth is a major factor in stimulating investment. This confirms the validity of accelerator principle. The result justifies the argument that conducive economic environment enhances investment activity in the economy. Better economic condition through increase in income is a signal of optimism and leads to high rates of investment [DeLong and Summers (1992); Blomstrom, *et al.* (1996); Booth (1999); Ghura and Goodwin (2000); Krishnaa, *et al.* (2003)].

The long run coefficient of user cost of capital (UC) shows negative sign and it is statistically significant. The result is consistent with neoclassical investment model which theorises that increase in cost of doing business leads to reduction in investment [Hall and Jorgensen (1967); Akkina and Celebi (2002)]. In the short-run, the coefficient of UC is positive and statistically significant. The neoclassical investment model treats real interest rate as an important and significant component of cost of doing business/capital and it generally effects investment negatively. However, real interest rate may have positive impact on investment in developing countries according to complementarity hypothesis of McKinnon (1973) and Shaw (1973).

It is postulated that a high rate of interest will increase the flow of supply of bank credit and by complementing the saving, result in facilitating investment [Luintel and Mavrotas (2005)]. This behaviour signifies the role of imperfect capital markets and credit constraints prevailing in developing countries. Positive sign supports the complementarity hypothesis postulated by neo-liberal approach accentuates the conduit/channel effect of saving to investment in the developing countries. According to findings, complimentary hypothesis holds in short-run only due to credit constraints, whereas in long-run investment is discouraged when the user cost of capital increases.

Table 2

Long-run Parameter Estimates

Independent Variables	Dependent Variable is Investment SBC Selected Model (4,0,3,4,0,2,3,0)	
	Coefficient	t-statistics
G	1.897961	4.11*
UC	-0.0037	-2.63*
FD	0.4909	38.21*
OP	0.7345	2.06**
PI	1.6844	4.61*
GSD	-3.8496	-2.02***
POL	0.0098	5.56*
ND	-0.1820	-5.38*
C	-8.4683	-1.15

Note: The coefficients significant at 1 percent, 5 percent and 10 percent levels are indicated by *, ** and *** respectively.

Table 3

Short-run Parameter Estimates

Independent Variables	Short-run Dynamics	
	Coefficient	T-stats
$\Delta I(-1)$	0.608	5.79*
ΔG	2.022	5.08*
ΔUC	0.001	3.04*
ΔFD	0.299	3.17*
ΔOP	0.783	2.32**
ΔPI	-2.164	-1.21
ΔGSD	-3.102	-2.43**
ΔPOL	0.010	5.01*
ΔND	-0.193	-4.42*
EC coefficient	-1.065	-6.99*

Note: The confidents significant at 1 percent and 5 percent levels are indicated by * and ** respectively.

In developing countries due to underdeveloped financial markets, interest rate does not reflect the true cost of capital and the availability of financial resources could be a more binding constraint rather than user cost. Thus the principal constraint on investment could be the quantity, rather than the cost, of financial resources and this justifies the inclusion of financial development variable (FD) proxied by domestic credit availability in the model [Akkina and Celebi (2002)]. Both the short-run and long-run estimated coefficients of financial development (FD) are positive and statistically significant as suggested by literature [Akanbi (2016)]. The estimates indicate that improvement of financial sector boosts aggregate investment by reducing the financial constraints. This finding is consistent with the hypothesis that financial intermediaries bridge the financial and the real sectors [also see Fry (1998); Agrawal (2000)].

Empirical research shows that more open economies attract more capital and financial flows than protected economies and provide the justification of including the trade openness variable (OP) in the analysis. In our empirical results, trade openness (OP) enters with a positive and statistically significant coefficient both in short-run and long-run. It indicates to possible boost in export-oriented sector which may in turn improve current account balance and induce investment [also see Asante (2000); Naa-Idar, *et al.* (2012)].

A well-developed physical infrastructure supports investment activities through many channels. Firstly it enhances the productivity of capital [Looney (1997)], secondly it reduces the transportation and transaction costs and ultimately increases the rate of return on investment [Barro (1990); Asiedu (2002)] and finally it provides better access to production resources and end good markets [Blejer and Khan (1984); Aschauer (1989); Badawi (2003); Suhendra and Anwar (2014)]. In line with empirical research, in the long-run contribution of physical infrastructure is positive and significant. But the effect of physical infrastructure on investment is negative in the short-run. The obvious reason is that advantages that physical infrastructure provides for investment occur in long-run, while physical infrastructure development in short run may disrupt transportation channels for the time being.

Macroeconomic uncertainty renders the adverse effects on investment decisions and discourages investment activities. As expected, macroeconomic uncertainty (captured through GARCH conditional standard deviation) has significantly negative effects both in long-run and short-run. Uncertainty causes sluggishness in investment through creating passive expectation about future. It hampers the investment decision by creating ambiguity about future cash-flows and expected raised business cost. The impact of uncertainty will be more pronounced in the presence of large sunk cost.

As already mentioned, political stability is captured through polity IV score, where higher score represents more democratic environment. The coefficient of political stability variable (POL) is positive and statistically significant both in long-run and short-run, indicating that improvement in political environment leads to higher level of investment activities. At first sight, the small magnitude of the estimated slope coefficient may indicate that the effect of political uncertainty on investment is not substantial. However, since the investment variable is in natural log form, the estimated slope coefficient indicates that increase in political stability score by one unit on the scale of -10 to $+10$ results in increase in investment by 0.98 percent in long-run and 1 percent in short-run. Or equivalently, we can say that five percentage points increase in political stability score results in about one percent increase in investment, which does not seem to be negligible.

Conversely, political instability (deterioration of political climate) shatters the investors' confidence and, hence, lowers the level of overall investment in the economy. The worsening political situations are associated with inconsistent and frequently changing economic policies and make investment climate unfriendly. In such situations, firms are much conscious about taxation and regulation policies. In such uncertain climate firms adopt wait and see strategy and tend to postpone their investment decisions.

Government policies in Pakistan shifted drastically during 1970s in the form of nationalisation of banking and large-scale manufacturing sectors. To capture the impact of this factor, a dummy variable (ND) is included and its coefficient is observed to be negative and highly significant. There would be many possible reasons of it. Firstly, shift in the government policy created an uncertain environment that shattered the confidence of the investors. Secondly it crowded the private investment out and shook the roots of the private investment structure. Further, inefficiency arising due to the government's control over banking system erupted financial backbone of the economy and investment level declined.

6. CONCLUSION AND POLICY IMPLICATIONS

The study has examined the effects of macroeconomic uncertainty calculated through real exchange rate volatility and political (in)stability captured by polity IV index on the aggregate investment in Pakistan, while controlling for other economic and government policy variables. The model, devised in the light of theoretical and empirical literature, is estimated by employing the ARDL approach using annual time series data from 1960 to 2015.

The results reveal that both accelerator theory and neoclassical investment model explain the aggregate investment behaviour quite significantly that is the output and user costs both are important in influencing capital formation/investment. Political stability,

government nationalisation policy and macroeconomic uncertainty are found to have adversely affected the overall investment in Pakistan. The 1970s nationalisation policy of government, especially for banking and manufacturing sectors, had discouraged investment activity in Pakistan. The positive indicators of economic performance like GDP growth rate, financial development, physical infrastructure and trade openness are all found to be important factors in promoting investment activity. High user cost of capital is found to be a binding constraint on investment in long-run only but it tends to promote investment in short-run by relaxing the credit supply constraint.

The study concludes that investment activity flourishes under stable political and economic conditions while uncertainty on either front is detrimental to investment climate. In addition, positive and sustained development in key economic indicators like economic growth, infrastructure and financial development and international trade is also essential to promote investment activity.

A number of lessons for investment policy can be drawn from the study. First, in order to make investment an economically viable activity in long-run, investment funds have to be committed for a sufficiently long duration. For realisation of such commitment consistency of economic conditions and political environment is crucial. A stable political/democratic environment not only ensures consistency of economic policies in long-run, but it also provides a milieu in which economic policies, especially fiscal and monetary policies, are guided by political economic considerations rather than pure political compulsions.

Second, even though financial sector of Pakistan has grown both in terms of size and efficiency over the past few decades, credit availability is still constrained by distortions mainly because of large scale crowding out of funds due to excessive public borrowing and loan defaults. These distortions can be eased by granting further autonomy to the entire financial sector of the country. Third, nationalisation of businesses has adversely affected investment climate in Pakistan. Although banking, telecommunication and education sectors and quite a few manufacturing industries have been privatised, certain industries like airlines and steel production also need to be privatised on priority basis in order to ease the drain on investable funds and to encourage profitable investment in these areas as well. Once the loss-making entities are no more a drain on government budget, funds would be easily diverted to infrastructure development, which is crucial to reduce the cost of doing business.

APPENDIX

Table A1

Unit Root Tests for Real Exchange Rate

Variables	Augmented Dickey Fuller (ADF)Test		Phillips Perron (PP)Test	
	Intercept	Intercept and Trend	Intercept	Intercept and Trend
RER	-1.452 (0.557)	-2.240 (0.465)	-1.430 (0.568)	-2.045 (0.574)
Δ RER	-13.05* (0.000)	-13.06* (0.000)	-17.44* (0.000)	-17.44* (0.000)

P-values are provided in the brackets.

The statistics significant at 1 percent are indicated by *.

Table A2

ARCH and Serial Correlation Tests for Real Exchange Rate

	ARCH LM TEST		
	ARCH(1)	ARCH(2)	ARCH(3)
Obs*R ²	79.17* (0.00)	89.88* (0.00)	91.16* (0.00)
Ljung-Box Q-Stat			
	Q(8)	Q(16)	Q(32)
Q-stat	102.7* (0.00)	126.8* (0.00)	134.4* (0.00)

Table A3

Autocorrelation and Heteroscedasticity Tests on the Residuals of Selected GARCH Model

	ARCH LM TEST		
	ARCH(1)	ARCH(2)	ARCH(3)
Obs*R ²	3.36 (0.18)	3.48 (0.47)	3.49 (0.74)
Ljung-Box Q-Stat			
	Q(8)	Q(16)	Q(32)
Q-stat	3.90 (0.272)	18.7 (0.06)	38.8 (0.11)

P-values are provided in the brackets.

Table A4

Unit Root Tests Results for Variables of ARDL Model

Variables	Augmented Dickey Fuller (ADF) Test		Phillips Perron (PP) Test	
	Intercept	Intercept and Trend	Intercept	Intercept and Trend
I	-1.523 (0.514)	-3.391*** (0.063)	-1.515 (0.518)	-2.824 (0.195)
Δ I	-5.64* (0.000)	-5.626* (0.000)	-5.472* (0.000)	-5.418* (0.000)
G	-5.194* (0.000)	-5.715* (0.000)	-5.207* (0.000)	-5.646* (0.000)
UC	-2.88* (0.055)	-3.929** (0.018)	-6.72* (0.000)	-6.801* (0.000)
FD	-1.750 (0.400)	-2.314 (0.420)	-2.776*** (0.068)	-2.659 (0.257)
Δ FD	-4.854* (0.000)	-4.986* (0.000)	-4.847* (0.000)	-4.996* (0.000)
PI ^I	-2.269** (0.0238)		-1.24 (0.1947)	
Δ PI			-3.794* (0.000)	
OP	-3.354** (0.017)	-3.931** (0.017)	-3.420** (0.014)	-3.923** (0.017)
POL	-2.391 (0.149)	-2.384 (0.384)	-2.661*** (0.087)	-2.666 (0.254)
Δ POL	-6.810* (0.000)	-6.746* (0.000)	-6.810* (0.000)	-6.747* (0.000)
GSD	-1.013 (0.741)	-2.190 (0.484)	-9.429* (0.000)	-10.55* (0.000)
Δ GSD	-62.57* (0.000)	-62.85* (0.000)		

P-values are provided in the brackets. The statistics significant at 1 percent, 5 percent and 10 percent are indicated by *, ** and *** respectively. In the test equation for PI there is no constant as it is de-trended variable.

Table A5

Diagnostic Tests of ARDL Model

Test	Statistic	P-value
AR(1) LM Test (1)	$n \cdot R^2 = 0.384$	0.535
ARCH (1) LM Test	$n \cdot R^2 = 1.106$	0.292
Normality test	JB-statistic = 2.39	0.302
Ramsey RESET Test	t-statistic = 0.78 F-statistic = 0.61	0.4408 0.4408
Number of Observations	55 (1960-2015)	
R ²	0.996	
Adjusted R ²	0.993	

Fig. A1. CUSUM and CUSUMSQ Tests for Parameters Stability

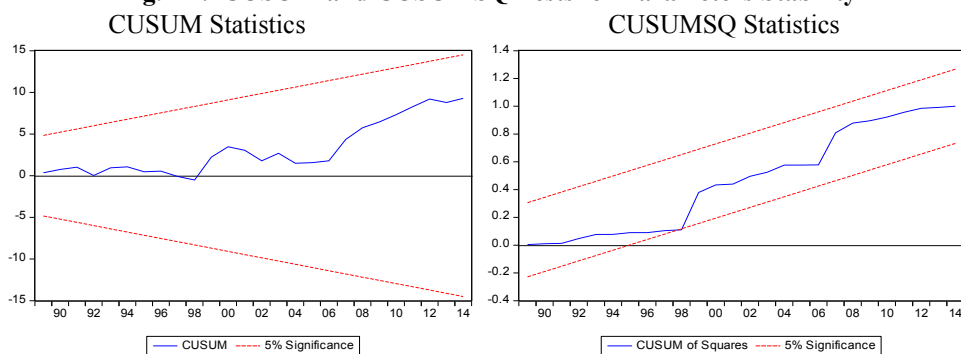


Table A6

Results of Bounds Test

Test Statistic	Calculated Value	Level of Significance	Lower bound Critical Value	Upper bound Critical Value
F-statistic	3.935	5%	2.32	3.50
		2.5%	2.6	3.84
		1%	2.96	4.26

REFERENCES

Abdelkader, H. E. M. (2017) Political Instability, Uncertainty, Democracy, and Economic Growth in Egypt. *Review of Middle East Economics and Finance* 13:2.

Abel, A. B., A. K. Dixit, J. C. Eberly, and R. S. Pindyck (1996) Options, the Value of Capital, and Investment. *Quarterly Journal of Economics* 111:3, 753–777.

Agrawal, P. (2000) Savings, Investment and Growth in South Asia. *Indira Gandhi Institute of Development Research* 1–47.

Ahmad, I. and A. Qayyum (2008) Effect of Government Spending and Macroeconomic Uncertainty on Private Investment in Services Sector: Evidence from Pakistan. *European Journal of Economics, Finance and Administrative Sciences* 11, 84–96.

Ahmad, I. and A. Qayyum (2009) Role of Public Expenditures and Macroeconomic Uncertainty in Determining Private Investment in Large Scale Manufacturing Sector in Pakistan. *International Research Journal of Finance and Economics* 26, 34–40.

Ahmad, I., A. Qayyum, and A. Salam (2008) Dynamic Modeling of Private Investment in Agricultural Sector of Pakistan [with Comments]. *The Pakistan Development Review* 47:4, 517–530.

Aizenman, J. and N. Marion (1999) Volatility and Investment: Interpreting Evidence from Developing Countries. *Economica* 66:262, 157–1179.

Ajide, K. B. and O. Lawanson (2012) Modelling the Long-run Determinants of Domestic Private Investment in Nigeria. *Asian Social Science* 8:13.

Akanbi, O. A. (2016) Macro and Institutional Determinants of Domestic Investment in Sub-Saharan African Countries. Available at: <http://uir.unisa.ac.za/bitstream/handle/10500/20163/Working%20paper%202007-2016.pdf>.

- Akkina, K. R. and M. A. Celebi (2002) The Determinants of Private Fixed Investment and the Relationship between Public and Private Capital Accumulation in Turkey. *The Pakistan Development Review* 41:3, 243–254.
- Alam, I. and R. Quazi (2003) Determinants of Capital Flight: An Econometric Case Study of Bangladesh. *International Review of Applied Economics* 17:1, 85–103.
- Alesina, A. and P. Roberto (1996) Income Distribution, Political Instability, and Investment. *European Economic Review* 40, 1203–1228.
- Alexander, C. (2009) *Market Risk Analysis, Value at Risk Models* (Vol. 4). John Wiley and Sons.
- Al Rahahleh, N. and M. I. Bhatti (2017) Co-Movement Measure of Information Transmission on International Equity Markets. *Physical A: Statistical Mechanics and its Applications* 470, 119–131.
- Al Rahahleh, N., M. I. Bhatti, and I. Adeinat (2017) Tail Dependence and Information Flow: Evidence from International Equity Markets. *Physical A: Statistical Mechanics and its Applications* 474, 319–329.
- Antoshin, S. (2006) Investment Under Uncertainty. Available at <https://ssrn.com/abstract=972722> or <http://dx.doi.org/10.2139/ssrn.972722>.
- Arize, A. C., T. Osang, and D. J. Slottje (2000) Exchange-Rate Volatility and Foreign Trade: Evidence from Thirteen LDC's. *Journal of Business and Economic Statistics* 18:1, 10–17.
- Aryeetey, E. (1994) Private Investment under Uncertainty in Ghana. *World Development* 22:8, 1211–1221.
- Asante, Y. (2000) Determinants of Private Investment Behaviour. Nairobi: African Economic Research Consortium. (AERC Research Paper No. 100).
- Aschauer, D. A. (1989) Does Public Capital Crowd-out Private Capital? *Journal of Monetary Economics* 24, 171–88.
- Asiedu, E. (2002) On the Determinants of Foreign Direct Investment to Developing Countries: is Africa Different? *World Development* 30:1, 107–119.
- Aysan, A. F., M. K. Nabli, and M. A. Vélez Rodríguez (2006) Governance Institutions and Private Investment: An Application to the Middle East and North Africa. *The Developing Economies* 45:3, 339–377.
- Badawi, A. (2003) Private Capital Formation and Public Investment in Sudan: Testing the Substitutability and Complementarity Hypotheses in a Growth Framework. *Journal of International Development* 15:6, 783–799.
- Balassa, B. (1988) The Lessons of East Asian Development: An Overview. *Economic Development and Cultural Change* 36:3, 273–290.
- Barro, R. J. (1990) The Stock Market and Investment. *The Review of Financial Studies* 3:1, 115–131.
- Barro, R. J. (1991) Economic Growth in a Cross Section of Countries. *Quarterly Journal of Economics* 106, 407–443.
- Belanová, K. (2014) Real Options Approach as a New View of Investment. *Ekonomické Rozhl'ady/ Economic Review* 43:3.
- Bernanke, B. S. (1983) Irreversibility, Uncertainty, and Cyclical Investment. *The Quarterly Journal of Economics* 98:1, 85–106.

- Bertola, G. and R. J. Caballero (1994) Irreversibility and Aggregate Investment. *The Review of Economic Studies* 61:2, 223–246.
- Bhatti, M.I. and C. Nguyen (2012) Diversification Evidence from International Equity Markets using Extreme Values and Stochastic Copulas. *Journal of International Financial Markets, Institutions and Money* 22:3, 622–646.
- Bleaney, M. and D. Greenway (2001) The Impact of Terms of Trade and Real Exchange Rate Volatility on Investment and Growth in Sub-Saharan Africa. *Journal of Development Economics* 65:2, 491–500.
- Blejer, M. I., and M. Khan (1984) Government Policy and Private Investment in Developing Countries. *IMF Staff Papers* 31:2, 379–403.
- Blomstrom, M., R. E. Lipsey, and M. Zejan (1996) Is Fixed Investment the Key to Economic Growth? *Quarterly Journal of Economics* 111, 269–276.
- Bloom, N., S. Bond, and J. Van Reenen (2007) Uncertainty and Investment Dynamics. *The Review of Economic Studies* 74:2, 391–415.
- Bob, N. K. (2013) Value-at Risk Estimation. A GARCH-EVT-Copula Approach. *Mathematiska Institutionen* 1-41.
- Bollerslev, T. (1986) Generalised Autoregressive Conditional Heteroscedasticity. *Journal of Econometrics* 31:3, 307–327.
- Booth, A. (1999) Initial Conditions and Miraculous Growth: Why is South East Asia Different from Taiwan and South Korea? *World Development* 27:2, 301–321.
- Brunetti, A. and B. Weder (1998) Investment and Institutional Uncertainty: A Comparative Study of Different Uncertainty Measures. *Weltwirtschaftliches Archiv* 134:3, 513–33.
- Caballero, R. J. (1999). Aggregate Investment. *Handbook of Macroeconomics* 1, 813–862.
- Caballero, R. J. and R. S. Pindyck (1992) *Uncertainty, Investment, and Industry Evolution* (No. w4160). National Bureau of Economic Research.
- Carruth, A., A. Dickerson, and A. Henley (2000) What do We Know about Investment under Uncertainty? *Journal of Economic Surveys* 14:2, 119–154.
- Chirinko, R. S. (1993) Business Fixed Investment Spending: Modeling Strategies, Empirical Results, and Policy Implications. *Journal of Economic Literature* 1875–1911.
- Clausen, B. (2008) Real Effective Exchange Rate Uncertainty, Threshold Effects, and Aggregate Investment: Evidence from Latin American Countries. (IWP Discussion Paper).
- Darrat, A. F. and S. R. Hakim (2000) Exchange-Rate Volatility and Trade Flows in an Emerging Market: Some Evidence from a GARCH Process. *Savings and Development* 287–302.
- DeLong, J. B. and L. H. Summers (1992) How Strongly do Developing Countries Benefit from Equipment Investment? *Journal of Monetary Economics* 32, 395–415.
- Dixit, A. K. and R. S. Pindyck (1994) *Investment under Uncertainty*. Princeton University Press.
- Dornbusch, R. (1976) Expectations and Exchange Rate Dynamics. *Journal of Political Economy* 84, 1161–1176.
- Engle, R. F. (1982) Autoregressive Conditional Heteroscedasticity with Estimates of the Variance of United Kingdom Inflation. *Econometrica: Journal of the Econometric Society* 987–1007.

- Engle, R. F. and C. W. J. Granger (1987) Co-integration and Error Correction: Representation, Estimation, and Testing. *Econometrica* 55, 251–76.
- Episcopos, A. (1995) Evidence on the Relationship between Uncertainty and Irreversible Investment. *The Quarterly Review of Economics and Finance* 35:1, 41–52.
- Feng, Y. (2001) Political Freedom, Political Instability, and Policy Uncertainty: A Study of Political Institutions and Private Investment in Developing Countries. *International Studies Quarterly* 45:2, 271–294.
- Ferderer, J. P. (1993) The Impact of Uncertainty on Aggregate Investment Spending: An Empirical Analysis. *Journal of Money, Credit and Banking* 30–48.
- Fry, M. J. (1998) Saving, Investment, Growth, and Financial Distortions in Pacific Asia and Other Developing Areas. *International Economic Journal* 12:1.
- Ghosal, V. and P. Loungani (1996) Product Market Competition and the Impact of Price Uncertainty on Investment: Some Evidence from US Manufacturing Industries. *The Journal of Industrial Economics* 217–228.
- Ghura, D. and B. Goodwin (2000) Determinants of Private Investment: A Cross-Regional Empirical Investigation. *Applied Economics* 32, 1819–1829.
- Granger, C. W. J. and P. Newbold (1974) Spurious Regressions in Econometrics. *Journal of Econometrics* 2, 111–120.
- Guiso, L. and G. Parigi (1999) Investment and Demand Uncertainty. *The Quarterly Journal of Economics* 114:1, 185–227.
- Hall, R. E. and D. W. Jorgenson (1969) Tax Policy and Investment Behaviour: Reply and Further Results. *The American Economic Review* 59:3, 388–401.
- Hamuda, A. M., V. Šulíková, V. Gazda, and D. Horváth (2013) ARDL Investment Model of Tunisia. *Theoretical and Applied Economics* 20:2.
- Haque, Nadeem Ul (2007) Entrepreneurship in Pakistan. Pakistan Institute of Development Economics, Islamabad. (Working Paper 2007:29). <http://www.pide.org.pk/pdf/Working%20Paper/WorkingPaper-29.pdf>.
- Ingersoll, J. E. and S. A. Ross (1992) Waiting to Invest: Investment and Uncertainty. *Journal of Business* 65, 1–29.
- Johansen, S. and K. Juselius (1990) Maximum Likelihood Estimation and Inference on Co-integration—with Applications to the Demand for Money. *Oxford Bulletin of Economics and Statistics* 52:2, 169–210.
- Jorgenson, D. W. (1971) Econometric Studies of Investment Behaviour: A Survey. *Journal of Economic Literature* 9:4, 1111–1147.
- Julio, B. and Y. Yook (2012) Political Uncertainty and Corporate Investment Cycles. *The Journal of Finance* 67:1, 45–83.
- Knight, F. (1921) Risk, Uncertainty, and Profit. *Hart Schaffner and Marx Prize Essays* No. 31. Boston and New York: Houghton Mifflin.
- Krishnaa K., A. Ozyildirim, and N. R. Swanson (2003) Trade, Investment and Growth: Nexus, Analysis and Prognosis. *Journal of Development Economics* 70, 79–499.
- Le, Q. V. (2004). Political and Economic Determinants of Private Investment. *Journal of International Development* 16:4, 589–604.
- Leahy, J. V. and T. M. Whited (1996) The Effect of Uncertainty on Investment: Some Stylised Facts. *Journal of Money, Credit and Banking* 28:1, 64–83.

- Lee, J. (2016) The Impact of Idiosyncratic Uncertainty When Investment Opportunities are Endogenous. *Journal of Economic Dynamics and Control* 65, 105–124.
- Lee, J. and K. Shin (2000) The Role of a Variable Input in the Relationship between Investment and Uncertainty. *The American Economic Review* 90:3, 667–680.
- Levine, R. and D. Renelt (1992) A Sensitivity Analysis of Cross-Country Growth Regressions. *The American Economic Review* 942–963.
- Looney, R. E. (1997) Infrastructure and Private Sector Investment in Pakistan. *Journal of Asian Economics* 8:3, 393–420.
- Lucas, R. E. J. and E. Prescott (1971) Investment under Uncertainty. *Econometrica* 39:5, 59–81.
- Luintel, K. B. and G. Mavrotas (2005) Examining Private Investment Heterogeneity: Evidence from a Dynamic Panel (No. 2005/11). WIDER Discussion Papers//World Institute for Development Economics (UNU-WIDER), 11.
- Majd, S. and R. S. Pindyck (1987) Time to Build, Option Value, and Investment Decisions. *Journal of Financial Economics* 18:1, 7–27.
- Mauro, P. (1995) Corruption and Growth. *The Quarterly Journal of Economics* 110:3, 681–712.
- McDonald, R. and D. Siegel (1986) The Value of Waiting to Invest. *The Quarterly Journal of Economics* 101:4, 707–728.
- Mckinnon, R. I. (1973) Money and Capital in Economic Development. Washington D. C.: Brookings Institution. Ministry of Industry and Trade, www.mit.gov.jo, Accessed in 2006.
- Morimune, K. and A. Mantani (1995) Estimating the Rank of Co-integration After Estimating the Order of a Vector Autoregression. *The Japanese Economic Review* 46:2, 191–205.
- Murshed, S. M. (2002) Conflict, Civil War and Underdevelopment: An Introduction. *Journal of Peace Research* 39:4, 387–393.
- Naa-Idar, F., D. T. Ayentimi, and J. M. Frimpong (2012) A Time Series Analysis of Determinants of Private Investment in Ghana (1960-2010). *Journal of Economics and Sustainable Development* 3:13, 23–33.
- Nguyen, C. and M. I. Bhatti (2012) Copula Modelling Dependency between Oil Prices and Stock Markets: Evidence from China and Vietnam. *Journal of International Financial Markets, Institutions and Money* 22:4, 758–773.
- Palaro, H. P. and L. K. Hotta (2006) Using Conditional Copula to Estimate Value at Risk. *Journal of Data Science* 4, 93–115.
- Parker, D. (2010) REIT Investment Decision-Making: A Multi-Step Process. *In Proceedings of the 16th Annual Pacific RIM Real Estate Society Conference* 24–27.
- Patnaik, R. (2016) Competition and the Real Effects of Uncertainty. Available at: <https://www.rhsmith.umd.edu/files/Documents/Departments/Finance/seminars-spring2016/patnaik.pdf>.
- Pattillo, C. (1998) Investment, Uncertainty, and Irreversibility in Ghana. *Staff Papers-International Monetary Fund* 522–553.

- Pesaran, M. H. and Y. Shin (1999) An Autoregressive Distributed Lag Modelling Approach to Cointegration Analysis in Econometrics and Economic Theory in the 20th Century: The Ranger Frisch Centennial Symposium Strom S, Holly A, Diamond P. Cambridge University Press. Cambridge UK. Available at: www.econ.cam.ac.uk/faculty/pesaran/ADL.pdf.
- Pesaran, M. H., Y. Shin, and R. J. Smith (2001) Bounds Testing Approaches to the Analysis of Long-run Relationships. *Journal of Applied Econometrics* 16, 289–326.
- Pindyck, R. S. (1986) Irreversible Investment, Capacity Choice, and the Value of the Firm. National Bureau of Economic Research, Inc. (NBER Working Papers 1980).
- Pindyck, R. S. (1993) Investments of Uncertain Cost. *Journal of Financial Economics* 34:1, 53–76.
- Pindyck, R. S. and A. Solimano (1993) Economic Instability and Aggregate Investment. In *NBER Macroeconomics Annual 1993*. MIT Press. 8, 259–318.
- Price, S. (1996) Aggregate Uncertainty, Investment and Asymmetric Adjustment in the UK Manufacturing Sector. *Applied Economics* 28:11, 1369–1379.
- Quinn, B. G. (1988) A Note on AIC Order Determination for Multivariate Autoregression. *Journal of Time Series Analysis* 9, 241–245.
- Rafindadi, A. A. and Z. Yosuf (2013) An Application of Panel ARDL in Analysing the Dynamics of Financial Development and Economic Growth in 38 Sub-Saharan African Continents. In *Proceeding-Kuala Lumpur International Business, Economics and Law Conference*.
- Rehman, H. U., S. Khan, and M. A. Khan (2009) What Determines Private Investment? The Case of Pakistan. *South Asian Studies. A Research Journal of South Asian Studies* 24:1, 52–68.
- Righi, M. B. and P. S. Ceretta (2012) Global Risk Evolution and Diversification: A Copula-DCC-GARCH Model Approach. *Brazilian Review of Finance* 10:4, 529–550.
- Rodrik, D. (1991) Policy Uncertainty and Private Investment in Developing Countries. *Journal of Development Economics* 36, 229–242.
- Romer, D. (2001) *Advanced Macroeconomics* (Vol. 4). The McGraw Hill Companies Inc.
- Rozeei, Z., T. Akhondzadeh, and G. Sameei (2014) The Study of the Effective Factors on Investment in Private Sector in Iran (with Emphasis on Uncertainty). *International Journal of Industrial Mathematics* 6:3, 255–264.
- Sakr, M. K. (1993) Determinants of Private Investment in Pakistan. International Monetary Fund.
- Serven, L. (1998) Irreversibility, Uncertainty and Private Investment: Analytical Issues and Some Lessons for Africa. *Journal of African Economies* 6:3, 229–68.
- Shaw, E. S. (1973) *Financial Deepening in Economic Development*. New York: Oxford University Press.
- Siddiki, J. U. (2000) Demand for Money in Bangladesh: A Co-integration Analysis. *Applied Economics* 32, 1977–1984.
- Sioum, A. S. (2002) Private Investment and Public Policy in Sub-Saharan Africa: An Empirical Analysis. Institute of Social Studies.
- Sjaastad, E. and D. W. Bromley (1997) Indigenous Land Rights in Sub-Saharan Africa: Appropriation, Security and Investment Demand. *World Development* 25:4, 549–562.

- Stewart, D. B. and Y. P. Venieris (1985) Socio-political Instability and the Behaviour of Savings in Less-Developed Countries. *The Review of Economics and Statistics* 55:7–563.
- Suhendra, I. and C. J. Anwar (2014) Determinants of Private Investment and the Effects on Economic Growth in Indonesia. *Journal on Business Review (GBR)* 3:3.
- Temple, P., G. Urga, and C. Driver (2001) The Influence of Uncertainty on Investment in the UK: A Macro or Micro Phenomenon? *Scottish Journal of Political Economy* 48:4, 361–382.
- Van Foreest, P. and C. G. De Vries (2003) The Forex Regime and EMU Expansion. *Open Economies Review* 14, 285–298.

Book Review

Rashid Amjad (ed.) *The Pakistani Diaspora: Corridors of Opportunity and Uncertainty*. Lahore, Pakistan: Lahore School of Economics. 2017. 337 pages. Price PKR 750.00.

The book “The Pakistani Diaspora, Corridors of Opportunity and Uncertainty”, which is edited by Rashid Amjad, is a collection of 17 academic essays on Pakistani migrants and Pakistani diaspora in different countries. This book presents diverse viewpoints in the study of diaspora. This book does not just analyse the size of the diaspora in a chronological manner, but it also provides important understanding of the cost and benefits associated with migration and assimilation of the migrants’ families in new environments.

In the first paper, the author tries to capture the salient features and dynamics of Pakistan’s “age of migration” across home and host countries. By 2017, the estimated diaspora was at 9.1 million – almost 5 per cent of Pakistan’s population. The labour class started to migrate to the UK in 1950s while highly skilled professionals started moving to the US and Canada in 1960s. The unskilled and semiskilled workers began to move to the Middle East in 1970s and due to easing off their visa policies in 1990s, migrants began moving to Europe, Singapore, Thailand, Malaysia and Australia from Pakistan. According to the author “A large number of people face losses in the struggle to migrate to foreign countries. A majority of illegal migrants are imprisoned in different countries while trying to reach Europe while dozens are killed on their way to Greece.”

The distinction among migrants, migrant workers, and diaspora communities is not always clear, and it is important to frame a simple working definition of “diaspora communities.” At the start of the article the author, Fareeha Zafar states, “the official Pakistani diaspora was estimated 8 million in 2014, although many believe this number could be significantly higher (between 10 to 15 million).” According to Weber (2011), “Diasporas are made historically: they continuously are in a position of negotiating about their rights and full association in their adopted nations”. The Pakistani diaspora has carved out a social, cultural, political, and economic space for them in the migrant world due to globalisation. They are well attached to their culture and religion and promoting the positive image through festivals in London and New York. The most prominent thing is that women of Pakistani origin have become more visible at the social, cultural and political level. Because of improved transport amenities, the generations that are born in the host countries now visit their home country.

The third article, “The Pakistani Diaspora in the United States” by Michal Kugelman, starts with the statement that the US is home to diasporas from many countries of the world and in term of size Pakistanis do not stand out as a prominent diaspora. According to the Migration Policy Institute, more than 450,000 Pakistanis and

their children live in the US. Nearly two-thirds of all Pakistani immigrants in the country are American citizens—the third-highest naturalisation rate of a group of 15 diaspora communities studied by MPI-2015. However, as compared to Pakistanis, the Indians hold key jobs in the media industry, the IT industry, and in Silicon Valley because of effective lobbying in the US Congress. The Pakistani are well educated, and the well-off diaspora is playing an important role in US society despite the harassment and discrimination. However, the Pakistani diaspora has not become a part of the US political system yet.

The fourth article, “The Pakistan-Europe Corridor” by Fareeha Zafar, talks about migration from Pakistan to Europe. According to the author, it has progressed through three phases but with an estimated annual outflow of 0.8 million, the future of potential migrants remains uncertain. There is no uniform approach to integrate immigrants due to anti-immigrant sentiments in Europe and Pakistani immigrants in Europe cannot portray a rosy picture due to the security situation in the rest of the world. The fifth article is not directly related to Pakistan, it focuses more on anti-immigration. Due to an uncertain security situation in the world, Europe is still not clear about immigrants. On the one hand, they need skilled labour, while on the other hand, anti-immigrant sentiments have escalated in their societies. So, most of the European countries are inclined to anti-immigrant policies.

The sixth article discusses the European refugee crises, which began in 2015 when a huge number of refugees began making the journey to EU to seek asylum, travelling across through the Mediterranean Sea or through Southeast Europe. The influx of refugees to Europe is likely due to a moderate loosening of fiscal policy leading to a positive impact on economic activity in the short run. In long term, migration is expected to increase the labour supply, thus encouraging economic growth while easing the financial problems that an ageing population tends to create in a social security system.

Article seven, entitled “The Pakistani Diaspora in the Gulf” by Nasra Shah, claims that the research on Pakistani diaspora in the Gulf is almost nonexistent. Migration to the Gulf has been a lifeline for many families and has helped alleviate unemployment and underemployment in Pakistan. The annual outflow of Pakistani workers has risen consistently since 2005, with about 700,000 workers leaving the Gulf in 2014. The impact on Pakistani workers is especially large as many of them are engaged in semi-skilled or unskilled jobs and can be easily replaced by workers from a less expensive source country. She proposes that strategies should be formulated for easing reabsorption of returnees in the home country.

The article, “The Cost of Migration from Pakistan to Saudi Arabia and the UAE” by Rashid Amjad, G.M. Arif, and Nasir Iqbal explains the role of “visa consultants” and cost of attaining work permits for the Middle Eastern countries. In the GCC region, the annual placement of Pakistanis low-skilled workers (labourers and farm workers) remains large. According to BEOE statistics, during the past two decades a significant number of Pakistanis have been placed in the GCC region. Securing a job in the UAE or Saudi Arabia, the survey found, entails terrifyingly high cost of migration for low-skilled workers as they pay approximately \$3,500 in the shape of fees for their employment. The survey also found that the cost of migration is quite different between two countries, namely UAE and Saudi Arabia. The average cost to work in United Arab Emirates was \$2,358, while for Saudi Arabia it was almost double at \$4,290. The situation is grim, and

it is very hard to identify the reasons for this difference, or why there is an apparent preference for working in Saudi Arabia. It may be that as compared to UAE, wages, working conditions and cost of living are more attractive in Saudi Arabia. For example, average earnings in United Arab Emirates are \$387 while in Saudi Arabia average earnings are \$480. It is essential to study the visa market in Pakistan in greater depth. While this article focuses on unskilled migrants and high costs in shape of visa fee, subsequent work should analyse, among other things, how key players and agents function and the role they play in the visa market.

The ninth article “Worker’s Remittances and the Pakistan Remittance Initiative” by Asma Khalid quantifies trade deficits, low inflows of foreign investment, and excessive reliance on debt inflows to finance the current account deficit. Although Pakistan has managed to divert a large share of remittances to official channels over the past few years, informal inflows remain significant. Low level of financial literacy, implying that people are unaware of and/or are unwilling to use banking facilities in the country. Going by conservative estimates, with the help of Pakistan Remittance Initiative (PRI) commercial banks could potentially tap an additional US\$ 5 billion from the informal market.

In the tenth article, which is titled “The Impact of Transnational Marriages on Pakistani Spouses in Britain”, Marta Bolognani argues that in the context of marriages, a common thread in the discussion is the presupposition of the existence of a migrant spouse of a typical character and nature. Therefore, assimilation and adjustment are assumed to be the responsibility only of the migrant and the role of the British counterpart is not given much importance.

The eleventh article is “Pakistani Diaspora Communities in Norway: Part of a Transitional Social Field for How Long?”, which is written by Marta Bivand Erda’s. The article focuses more on Pakistani diaspora communities in Norway and describes as part of a transnational social field that spans not just Norway in Pakistan but also other diaspora countries. Most Norwegian Pakistani families are now part of a history of migration that goes back half a century. Over time, the dynamics, strength, nature of this migration, and their ties to Pakistan have changed. The children of Pakistani migrants, who were born in Norway and are now Norwegian citizens, see themselves increasingly as Norwegian, fully and equally participating in the Norwegian society. Despite the ambivalence among youth related to an Islam phobia climate, there are voices clearly calling for the descendants of Pakistani migrants to see themselves as fully Norwegian, but also to value their Pakistani heritage.

The political participation in the UK is the topic of the twelfth article, which is penned by Parveen Akhtar. According to the author, the UK has the second-largest overseas Pakistani population after Saudi Arabia and by 2031, an estimated 2.6 million Britons are likely to have Pakistani ancestry. On 5 May 2016, the son of an immigrant Pakistani bus driver was elected as mayor of London but in Pakistan, it would be almost implausible for children from lower-middle-class backgrounds to end up holding a high political office. According to Akhtar, Pakistani immigrants tend to arrange transnational marriages within families, as a way to spread opportunities among their relatives back home. The government has perceived these marriages as economic migration and seen as posing a serious threat to native customs and culture. The argument rests on the premise

that these marriages often lack romantic legitimacy. Thus, the British government has introduced rigorous policies to control such unions. The article also argues that the Pakistani diaspora is insignificant in the political life of the UK. However, now the Pakistani diaspora is represented in the British political system, Sadiq Khan, the mayor of London being one such example. The article provides a collective political biography of Britain's Pakistani diaspora and assesses the shape of future political linkages between the UK and Pakistan.

In the thirteenth article titled, "Circuits of Knowledge: Learning from the Pakistani Academic Diaspora and Teaching Them in Return", S. Akbar Zaidi tries to engage with some of the issues affecting the state of the social sciences in Pakistan in the second decade of the 21st century, where the emergence and presence of diaspora academics play an increasingly important role. There is no denying that the social sciences are undergoing a revival in the country and that its diaspora and linkages with individuals and institutions in the West have a role to play in this. Diasporas play an important role in the economic development of their native countries and remittances have provided relief to Pakistan's current account and spurred domestic growth by injecting demand into the economy.

Tari Saigol in his article titled "Transnational Business and Investment Possibilities: The Role of Pakistan's Diaspora" argues that the Pakistani diaspora accounts for relatively little FDI and the bulk of remittances go towards supporting workers' families in Pakistan from which some part is spent on purchasing real estate as a form of investment and on philanthropy, especially in the wake of a natural disaster. In 2015, the Pakistani diaspora remitted about US\$ 19.3 billion to the country accounting for 7.2 per cent of GDP and 65.3 per cent of its exports of goods and services (World Bank 2017). Based on the experience of Indian and Chinese diasporas the author recommends a series of measures that would help Pakistan make more effective use of its diaspora.

The purpose of Piyasiri Wickramasekara's essay, "Engaging with Diasporas: Lessons from India and China", is to highlight the Chinese and Indian experience of engaging with their diaspora by explaining some definitional and methodological issues and to draw some lessons. The author has drawn two important lessons. Lesson one is creating an overall policy environment and incentives that are conducive to investment, and lesson two is creating a problem-free environment for foreign investors. The sixteenth article, "Migration and Development: Some key lessons" by Manolo Abella, explains that despite the horrendous conditions that often characterise migration millions of people especially those living in poor countries or those suffering from violent civil conflict still see migration as their main avenue for escaping poverty and finding some security. Staying at home is not an "inferior" good, so more people opt to stay on reaching a level of income that offers enough comfort and security for the family although threshold income is not the same nor unique in all countries. Demographic, political and social determinants may be more important factors than income levels in some countries. Migration, especially of the highly-skilled, can entail high social costs when it reduces the productivity of others but may also motivate many more people to invest in education and training than the number who will eventually leave.

The last chapter by Ibrahim Awad, which is titled “Engaging Diaspora in Development” explains that political and economic stability is a critical factor for attracting contributions to development. In the absence of a stable macroeconomic framework, diaspora members will be reluctant to transfer financial resources or to make investment in home countries. This brings out the importance of general macroeconomic and regulatory policies and not only of measures especially targeted at diasporas.

In sum, the book under review offers important insights into migration and the experiences of the migrants. However, a concluding chapter, or a section, in the book should have been devoted to policy recommendations. The addition of such recommendations would have improved the quality of the book and aided the readers in Pakistan to better understand the problems the Pakistani diaspora face in different countries. Finally, the author has grouped 17 different papers into a book. However, some papers, (such as papers 5, 6 and 15) have no direct relevance with the Pakistani diaspora. The book is weak in theoretical perspective and focuses more on policy. Although the book has certain shortcomings, it is an important contribution to the academic discourse on migration and the issues faced by the Pakistani migrants in host countries.

Usman Ahmad

Pakistan Institute of Development Economics,
Islamabad.