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Determinants of industrial development: a panel analysis of South Asian economies

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Abstract
A well performing industrial sector plays an important role in poverty mitigation, unemployment reduction, trade promotion, exchange of goods and services, increased per capital income and GDP growth etc. Numerous studies have investigated the institutional financial performance and their outcomes for emerging states predominantly in perspective of South Asian and African economies. Nonetheless, after global financial crisis and fall of Bretton wood system a new debate was generated to re-examine the issue after implementation of financial liberalization policies in these economies. Numerous studies conducted in this context recommended further re-examination in order to develop a sound financial and Institutional framework which could prove to be productive for the financial development but very limited studies investigated the problem in the context of industrial development. Therefore, the central theme of the current study is to investigate the industrial development relationship for a sample of South Asian Countries. The occurrence of operational, administrative, political and institutional uncertainties in the South Asian region makes it important to study the issue from a policy perspective. With this background in mind the present study aims to ascertain numerous determinants of industrial development in terms of capital account openness, trade openness, equity openness, governance, domestic credit available to the private sector, inflation and foreign direct investment (FDI) for a sample of South Asian economies i.e. Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan and Sri Lanka except Afghanistan (No data). To carry out empirical analysis, the study utilized Panel data set over the period 1996–2015 (Post liberalization period). For this purpose Industry Value Added has been used as a measure of Industrial Development; Chinn Ito Index (KAOPEN) as a measure of Capital Account Openness, ratio of the sum of imports and exports relative to GDP as measure of Trade Openness, Equity Openness has been measured by Market Capitalization to GDP Ratio, World Governance Indicator (WGI) has been used to measure Governance and Domestic Credit Available to Private Sector, FDI and Inflation have been measured in terms of percentage of GDP. The data has been majorly collected from international financial statistics, world development indicators, World Governance Indicator (WGI) and Journal of Development Economics. Furthermore, Granger's Causality Test to identify the unidirectional and bidirectional relationship and Panel ARDL technique to determine significant predictors of industry development in SAARC economies has been applied. Findings reported Governance, Foreign direct Investment, Equity Openness and Inflation as significant contributing factor in industrial

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development of South Asian region economies. The study also discussed the models from policy perspective and provides recommendations for the policy makers to improve or redesign favorable policies based on findings.

Keywords Industrial development · World Governance Indicator · Domestic credit available to private sector · Equity openness · Trade openness · Capital account openness · Chinn Ito Index

1 Introduction

Industrialization being significant determinant of economic development and growth has become into limelight since last two decades for the theorists and researchers. Countries desirous of better economic growth will have to pay huge cost for neglecting industrialization. Industrial growth contributes optimally in reducing price levels, creation of occupation, improved national income, technical advancement, stimulating transportation, agriculture, production, trade, mining, farming, forestry and all other economic activities. Moreover, it improves employment opportunities, training, educational development, labor productivity, regional development, resource allocation and utilization (Levine 2003).

Industrial growth is marked as a "process based on complex forces generally rooted in new general processes most aptly characterized as practices of modernization" (Walton 1987). Findings show that emerging economies with well-developed and competitive industrial sector flourish more rapidly as compared to other economies. Kniivilä (2007) narrated better economic growth and reduced poverty levels in industrially developed economies like Korea, China and Indonesia. In contrast to this, poor economic condition along with under developed industrial sector leading to economic crisis was reported in least developed economies (LDE) during the period of 1970s and 1980s. Such economic downturn compels implementation of key procedural restructurings and market-friendly inducements in the form of Structural Adjustment Program (SAP) by International Monetary Fund (IMF) and World Bank (WB) during the late 1980s and early 1990s in the crisis ridden economies (Rajan and Zingales 1996). The major objective of the reforms was to liberate and develop financial markets focusing at financial stability, competition, novelty, export expansion, industrial development, trade liberalization, and economic stabilization (Kabango and Paloni 2010).

Numerous factors that contributed to industrial growth after financial reforms were identified by researches among which financial sector openness realizes a key prominence. In this context, Ang and Mckibbin (2007) stressed the positive impact of financial reforms on industrial progress and economic wellbeing. However, Singh (1997) emphasized the negative influence of financial openness on industrial growth in emerging economies. In contrast to this, Heeks (1996) claimed partial benefits of financial openness on growth of Indian Software industry. Moreover, studies also narrated improved growth due to Capital Account Openness in few developing countries however poor performance and financial crises were also reported in some countries (Prasad et al. 2005; Bhagwati 2004; Stiglitz 2002 and Atiq 2014). Therefore, emphasizing the inconclusive effect of financial restructuring on growth of domestic industry in different economies (Prasad et al. 2005).

Furthermore, the concept of Governance and its role in contributing the institutional effectiveness for Industrial Growth and policies has also been recently emerged (Chinn and Ito 2006). Literature evidenced that countries with steady macroeconomic policies,

improved quality institutions and better financial markets enjoy more benefits of financial openness (Galindo et al. 2007). Henceforth, it is remarkable to indicate here, that Industrial Development, financial liberalization in terms of Capital Account Openness, Equity Openness, Trade Openness and better Governance structure can collectively play a significant role in boosting growth of Industrial sector of Economy ultimately encouraging overall Economic Stability. In addition, studies also evidenced that these all factors act as pillar for industrial betterment one without other fails to produce desired outcomes (Goyal 2012). Furthermore, the studies also reported that effect of financial liberalization differ in different Economies because of difference in institutional growth, Governance structure, legal and investment market environment, different macroeconomic environment and policies being practice. Moreover, strong financial and legal institutional capacity must be developed before introducing productive policies and achieving benefits of liberalization reforms process (Chinn and Ito 2006).

Henceforth, we can assert that huge amount of literature discusses the association among financial openness and its impact on financial development. The studies pertinent to this relation predominantly focus on three avenues i.e. positive link among financial development and financial liberalization (McKinnon and Shaw 1973). Secondly, financial liberalization is not a risk free process and evidence has been found regarding the economic crisis in numerous developing nations due unstable financial markets, unstable macroeconomic indicators and weak infrastructure BeKaert et al. (2005) and Kose et al. (2009). Lastly, the studies focusing on association among financial reforms and growth along with the consideration of institutional factors (Arestis 2006). The literature related to third strand is very scarce; one of the reasons might be the non-availability of statistics regarding the institutional variable (World Governance). Therefore the current study finds the association among Financial Openness Factors, Institutional Factors and Macroeconomic Factors with Industry Development.

Hence, the current study fill the gap existing in literature in this aspect and arguments that the Asian financial crisis that hit several countries in 1997–1998 followed by 2007–2008 economic crises has raised serious apprehensions among policy-makers and researchers on the dependability and stability of industrial sector development. Therefore, the biggest challenge for the developing economies is to devise a policy framework to fully identify the potential drivers of Industrial Growth so as to achieve a leading position in the global economy. In view of rapid transformation of the global economic order, it is mandatory for developing economies to reposition themselves in the world economy; therefore, the current study is an effort to identify how South Asian countries can redefine the prosperity paths in changing global economy for which different determinants of Industrial Development in selected South Asian countries i.e. Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan and Sri Lanka have been investigated (Except Afghanistan, no data). The justification for considering the selected South Asian economies is the prevalence of cultural, social and historical similarities among them (Wagle 2007).

After having detailed review of literature pertinent to financial restructuring in emerging nations, situation of Governance and macroeconomic atmosphere, the current study puts an effort to formulate significant structure to assess different determinants of Industrial Development and examines predominantly less investigated and inconclusive determinants based on literature review. Therefore, in present research predominant independent variables includes Capital account Openness, Trade Openness and Equity Openness (recommended by Bahmani-Oskooee 1993; Prasad et al. 2005; Heeks 1996; Singh 1997; Bekaert et al. 2011) Governance (recommended by Chinn and Ito 2006; Galindo et al. 2007; Blackburn and Hung 1998; Smith 1776; Prasad et al. 2005; Kose et al. 2009), Domestic credit

available to private sector (recommended by Ozyurt 2009) Foreign Direct Investment (FDI) (recommended by Blomström and Kokko 1996; Alfaro et al. 2003; Haddad and Harrison 1993; Singh 1992) and Inflation (recommended by Mamo 2012; Sidrauski 1967; Fischer 1993; Paul et al. 1997; Barro 1999) as determinants of industrial development.

The major objective of study is to investigate the impact of capital account openness (CAO), trade openness (TO) and equity openness (EO), governance (GOV), FDI, inflation (INF) and DC on industrial development during post liberalization era for a sample of selected SAARC countries. The major research questions include the direction, magnitude and relationship between independent variables and industrial development for a sample of selected SAARC countries, the impact of CAO, TO and EO, Gov, FDI, INF and DC on Industrial development during post liberalization era for a sample of selected SAARC countries and the feasible policy measure which should be taken for development of industry of each SAARC Economies.

2 Literature review

2.1 Theoretical perspective

Theoretically, Keynesian and Neo-classical economist supports the notion that low interest rate policy practiced before liberalization lead to high investment therefore causing more economic growth in developing economies. Later, this school of thought has been challenged by McKinnon (1973) and Shaw (1973) who contended that lower interest rate may increase inflation rate therefore causing currency depreciation and capital flight leading to poor savings and investments. Allocative Efficiency view point grounded on neoclassical growth model pioneered by Solow (1956) suggests that financial openness results in efficient allocation and distribution of funds from capital rich industrialized nations to capital-scarce unindustrialized countries (Fischer 1998; Obstfeld 1998; Obstfeld and Rogoff 1994; Summers 2000).

According to neo classical model developed by Robert Solow (1956), capital accumulation is a foremost important factor contributing in financial development. It narrates that productivity is achieved using capital, labor, and a Cobb–Douglas production function with labor-augmenting technical advancement. Fagerberg (1994) described productivity growth as an increase in output per worker. According to Jones et al. (1998) economic growth is usually rapid when economy is below the steady state however; all increase in per capita income is caused due to exogenous technological change when economy reached its steady state. Theorist stated that human capital only partly decreases the unexplained growth—or Solow residual. Romer (1986, 1990) and Lucas (1998) described Solow residual and considered (R&D) activities as primary cause of technological revolution in an economy. Theorists also showed that ideas and knowledge also contribute significantly in improving the output and returns. Romer (1986) and Lucas (1998) further suggested that government through good governance have a have ability to effect long term economic development and that any government policies aiming at rising investment rate will definitely increase the productivity and labor efficiency which in turn enhance development of industry. Hereafter, endogenous growth model narrates that economic growth is basically determined by the economic activities i.e. production, consumption and formation. Different factors that could contribute in productivity include technological innovation, governance, free capital

flows, trade openness and macroeconomic policies aiming to boost industrial production and in turn economic growth.

Moreover, according to Schumpeter theory, production is characterized by a blend of material and non-material dynamic factors. The material factors comprise of unique elements of production i.e. land, capital, labor etc. while the immaterial factors encompasses 'technical facts' and 'facts of social organization'. According to Schumpeter the industrialists play a significant role in economic development. This school of thought further acknowledges industrialists for innovations and the upsurge of economic development (Siddharthan 1984). Schumpeter further elaborates that, Innovation involves (1) Introduction of a new goods (2) introduction of a new methods of production (3) introduction of a new organization in an industry (4) the discovery of a new source of supply of raw materials or semi-manufactured goods, and (5) the opening of a new market which could be achieved by adopting financial openness policies (Siddharthan 1984). Liberal financial system is characterized by opening capital account and removing "financial repression", allowing financial sector to mobilize savings for the purpose of investment, by make provision of domestic credit to private sector easy, trade openness, enable and promote Foreign direct investment, portfolio investment in capital markets and optimize the Allocative efficiency (Team 2004). Furthermore, Schumpeter's theory also implied a strong and positive connection between trade openness, FDI and industrial development as a result of international dissemination of technological innovation from developed to developing countries (Coe and Helpman 1995; Grossman and Helpman 1991).

2.2 Empirical literature review

Numerous studies signified Industrial Growth, local market size and trade liberalization as significant contributors of Economic Growth. (Guadagno 1960a, b; Cornwall 1977; Fagerberg and Verspagen 2002). Research on textile manufacturing industry in emerging economies of South Korea and Philippines narrated government society relation, government structure, industrial structure and trade patterns as noteworthy elements for Industrial Growth (Lee 1992). Technical skills were also evidenced as a considerable factor in improving industrial production in Malaysia, Korea, Hong Kong, Taiwan and Singapore (Shin 2003). Furthermore, Trade Openness also positively influences manufacturing growth by improving export development of a county (Babatunde 2009; Edwards 1998). Ng and Yeats (1998) evidenced country Governance structure, state policies and national trade as significant factors for Industrial Growth. Moreover, availability of best capital equipment and quick application of novel industrial practices and skills likewise contributed significantly in Industrial Growth in Latin America (Prebisch 1962).

Furthermore, Capital Account Openness positively impact Industrial Growth but only in countries with relatively well-developed financial systems, rule of law, strong creditor rights and good accounting standards. The study further recommended certain threshold level of institutional and economic development in order to achieve benefit from capital account liberalization (Eichengreen et al. 2011; Klein and Olivei 2008; Mirdala 2006). In addition to this Honohan (2004) evidenced infrastructure stability as a catalyst for Industrial Development. Alfaro et al. (2004) investigated the association between FDI, financial markets and its impact on Industrial Growth and reported that FDI alone displays an uncertain role in bringing Industrial Development however, countries with financially liberalized economic markets gain more benefits from FDI. Furthermore, some studies also evidenced improved Total Factor Productivity (TFP) of local firms because of FDI (Caves 1974; Globerman

1979). Conversely, several studies showed negligible effect and an ample amount of studies reported negative impact of FDI on Total Factor Productivity growth in Africa, Asia and Latin America (Haddad and Harrison 1993; Singh 1992; Agosin and Mayer 2000).

Furthermore, Mamo (2012) showed that the relationship between Economic Growth and Inflation may be positive, negative and neutral. Stockman (1981) and Zhang (2000) exhibited that anticipated Inflation reduces the demand for real balances (i.e. higher price level decreases the purchasing power of money resulting in a decrease in consumption expenditures, investment expenditures, government purchases, and net exports) which indirectly lowers the demand for capital and adversely affects Industrial Growth. Ghosh and Phillips (1998) studied relationship between Inflation and growth for 145 industrialized, semi industrialized and unindustrialized developing countries and reported significant positive association when Inflation is low however, it turned negative in case of high Inflation. Moreover, the complexity of association was further tested for industrial as well as developed countries and results reported negative relationship between Inflation and growth in industrial economies however a positive association was evidenced in developing countries. In addition, literature also narrates that absence of Domestic Credit Available to Private Sector seriously hampers the growth of domestic industry. A study investigating the impact of availability of bank credit on growth of different sectors using sectorial Panel data for Kenya reported a significant impact of credit availability on sectorial gross domestic product measured as real value added (Nzomoi et al. 2012).

Furthermore, Rivera-Batiz (2002) declared democracy as a significant determinant of Total Factor Productivity (TFP) growth but only if the democratic institutions ensure implementation of quality of Governance. Campos and Nugent (1999) and Kraay et al. (1999) declared that better Governance measures improve the Industrial Development. Haber and Musacchio (2004) demonstrated same findings in Mexico and United States. Moreover, studies signified level of corruption as a potential factor that hinders quality of Governance in an economy for which proper precaution must be developed before implementing the economic policies. Blackburn and Forgues-Puccio (2010) suggested that corruption negatively impact economic development of a country hence indirectly effecting performance and output of industrial sector. Furthermore, the findings showed that low income economies face more harmful effects of corruption as compared to developed and high income countries. Researcher after performing comparative study reported that economically restructured states are more at risk to be involved in corruption and vice versa. Hence concluding that better Governance is mandatory for enjoying the optimal benefits of financial restructuring and failure to do so will lead to poverty and corruption in developing and poor countries.

Apropos in view, studies suggested implementation of strong institutions and macroeconomic policies framework in Least Developed Economies to achieve benefits of financial openness for industrial sector (Klein and Olivei 2008; Villanueva and Mirakhor 1990; Voghouei et al. 2011). Likewise, diminishing industrial output was reported in African countries due to lack of strong institutions, poor Governance structure and macroeconomic policies framework during post liberalization era (Kouassi 2008). McKinnon (1973), Shaw (1973) and Fry (1997) also anticipated that achievement of financial reforms is dependent on certain prerequisites comprising implementation of practical principles, budget discipline, controlling Inflation and stable macroeconomic environment henceforth, requiring advance in-depth analysis. Certain conflicting findings also evidenced negative consequence of Trade Openness on industrialization of sub-Sahara African countries

predominantly because of underprivileged macroeconomic policies (Shafaeddin 2000; Rodriguez and Rodrik 2001). Furthermore, ample amount of literature describes the role of financial development on growth but the studies that investigated bank credit or domestic credit available to private sector on country level and its impacts on the industrial growth and economic growth have been overshadowed (Nzomoi et al. 2012). Besides this, mixed findings (positive, negative and negligible) with respect to association of FDI with Industrial Growth in emerging economies have also been reported therefore suggesting for further analysis (Blomström and Kokko 1996). Similarly, literature evidence positive, negative and lack of association among Inflation and Industrial Growth in developed and developing economies consequently recommending for further investigation (Mamo 2012).

Hereafter, we can safely conclude that emerging and developing economies require to develop and implement strong macroeconomic policies for controlling corruption, implementing rule of law, maintaining political stability, government effectiveness, strong Governance structure, improve accountability standards and well performing transparent system to successfully benefit from outcomes of financial reforms and achieve its optimal influence on Industrial Development and growth of industries otherwise the results would be detrimental and could have potential to generate economic crisis. Hereafter, originating an argument among theorists and strategy makers pertinent to investigation of significant determinants of Industrial Development in emerging economies therefore, stimulating for further investigation in context of selected SAARC economies i.e. Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan and Sri Lanka.

3 Theoretical framework

3.1 Model, methodology, data and variables

Apropos in view, the current study is designed on (1) Keynesian and Neo classical model which characterizes the link of FDI with the industrial growth by narrating the fact that low interest rate policy causes high direct and indirect investment in the industrial sector therefore improving labor efficiency and later overall manufacturing productivity. (2) Furthermore McKinnon (1973) and Shaw (1973) establishes the connection of inflation with the industrial development by contending that lesser interest rate policy boosts market inflation rate and discourage saving and investments making scarce availability of funds to industrial sector for supply chain management activities and consequently poor industrial growth. (3) Allocative Efficiency view point pioneered by Solow(1956) also discusses the association of financial openness with the production output of developing economies by relating that financial openness i.e. Capital account Openness, Trade Openness and Equity openness results in efficient allocation and distribution of funds from capital rich industrialized nations to capital scarce unindustrialized countries which encourages FDI and equity investment in manufacturing sector eventually enlightening the yield of industrial sectors in emerging economies. (4) Robert Solow (1956) further establishes the link between high productivity and capital accumulation, labor and Cobb–Douglas with labor-augmenting technical advancement which is achieved through technology transfer, skill development and expertise achieved through improved FDI and opening up of national

boundaries for trade. (5) Endogenous growth model proposed by Romer (1986, 1990) and Lucas (1998) emphasis on the importance of research and development activities, technological innovation, free capital flows, managerial expertise, innovative ideas, knowledge and skill diffusion by opening up of borders for international trade and investment opportunities in industrial sector of economy. Furthermore it also stresses that better government control, improved macroeconomic policies and good governance have an ability to effect long term development of manufacturing sector of the economy as it contributes meritoriously in economic growth. (6) Lastly, the Schumpeter theory stressed upon the importance of industrialist for economic development and further discusses the relationship of technological advancement, innovation, growth of productive factors and investment friendly socio-cultural environment for the productivity. Schumpeter along with other factors emphasis on *opening of a new market* for better productivity which could be achieved by adopting financial openness policies of Capital account Openness, Equity Openness and Trade Openness. Moreover, it allows financial sector to mobilize savings for the purpose of investment, by make provision of domestic credit to private sector easy, and promote foreign direct investment, portfolio investment in capital markets, exports of goods, government control, better governance measures and efficient resource allocation to industrial sector aiming at improved productivity.

Based on the previous studies, economic models and data availability, the current study examines the impact of different factor on industrial development from South Asian perspective. Different financial openness factor in term of *capital account openness, Trade openness and equity openness, institutional factor in terms of Governance and lastly economic factor in terms of Inflation, FDI and Domestic credit available to private sector* are used to investigate their impact on Industrial development. Below is the elaboration of importance and link of Chosen explanatory variables with explained variables. (CAO), (TO), (EO), (GOV), (DC), (FDI) and (INF)

$$Yg = f(CAO, EO, TO, GOV, DC, FDI, INF) + \mu it$$

where Yg represent Industrial value added, CAO represent Capital account openness, EO represent Equity openness, TO represent Trade openness, Gov represent Governance, DC represent Domestic credit to Private sector, FDI represent Foreign direct investment and INF represent Inflation variables.

Following the variable scheme used by Udah (2010) and Ellahi (2011) we can write the equation in following form.

$$\begin{aligned} In(INDV) = {} & \beta_0 + \beta_1(InINDV)_{i,t-1} + \beta_2(CAO)_{i,t-1} + \beta_3(GOV)_{i,t-1} \\ & + \beta_4(TO)_{i,t-1} + \beta_5(DC)_{i,t-1} + \beta_6(INF)_{i,t-1} + \beta_7(FDI)_{i,t-1} + \mu_{it} \end{aligned}$$

where β_0 = constant term, $\beta_1 \ldots \beta_7$ = coefficients of the exogenous variable and μ_{it} = error term. where the subscript i denote the ith country ($i = 1 \ldots 2$) and the subscript "t" denotes that tth year ($t = 1 \ldots$). In (INDV) represents industry value added, In $INDV_{i,t-1}$. Capital account openness (CAO), Trade openness (TO), Equity Openness (EO), (GOV) is governance indicator, (DC) Domestic credit, FDI, inflation rate (*INF*), μ_{it} is an *iid* (independently distributed) error term with $E(\mu_{it})=0$ and the subscripts i show country and time period respectively.

3.2 Variable description

Variables	Definition	Units of measurements
Capital account openness (CAO)	It is the free movement of capital across national boundaries. It has two extreme values − 2.66 i.e. complete capital controls and 2.66 i.e. complete liberalization of financial market	KAOPEN index
Trade openness (TO)	External and Internal coordination of an economy for trade purpose	$Imports + $Exports/$GDP
Governance	An index based on method of collection, monitoring and replacement of government. Estimate of governance ranges from approximately − 2.5 (weak) to 2.5 (strong) governance performance	World Governance Indicator (WDI) based on six dimensions i.e. Voice and Accountability, Rule of Law, Government Effectiveness, Political Stability, Regulatory Quality and Control Of Corruption
Equity market openness (EO)	Openness of Stock market for international investors	$Market capitalization/$nominal GDP
Foreign direct investment (FDI)	An investment carried out by organization or individual in one country in business interests in another country	% of GDP
Domestic credit available to private sector (DC)	Financial funds provided to the private sector by financial organizations, in the form of loans, non-equity securities, trade credits and other accounts receivable, with a claim for reimbursement	Domestic credit to Private sector % of GDP
Inflation rate (INF)	It is annual log difference of consumer price index(CPI)	% of GDP
Industrial development	Growth in manufacturing sector of an economy	Industry value added in Dollar

3.3 Data sources and study sample

For the purpose of current research Time series data over time period 1996–2015 has been utilized. The predominant data sources included International Financial Statistics (IFS), World Development Indicators (WDI) and World Governance Indicators (WGI). Chinn Ito Index was used to measure Capital Account Openness dimension of financial openness and it is taken from Journal of Development Economics (JDE). Sample of seven South Asian countries were used for analysis including Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan and Sri Lanka.

4 Estimation techniques

4.1 Dumitrescu–Hurlin panel Granger causality test

The Dumitrescu–Hurlin test in a seminal paper, Granger (1969) developed a methodology for analyzing the causal relationships between time series. Suppose x_t and y_t are two stationary series. Then the following model

$$y_t = \alpha + \sum_{k=1}^{K} \beta_k y_{t-k} + \sum_{k=1}^{K} \gamma_k x_{t-k} + \varepsilon_t \tag{1}$$

can be used to test whether x causes y. The basic idea is that if past values of x are significant predictors of the current value of y even when past values of y have been included in the model, then x exerts a causal influence on y. Using (1), one might easily test this causality based on an F-test with the following null hypothesis:

$$H_0 : \gamma_1 = \cdots = \gamma_K = 0 \tag{2}$$

If H_0 is rejected, one can conclude that causality from x to y exists. The x and y variables can of course be interchanged to test for causality in the other direction, and it is possible to observe bidirectional causality (also called feedback). DH provides an extended test designed to detect causality in panel data. The underlying regression writes as follows:

$$y_{i,t} = \alpha_i + \sum_{k=1}^{K} \beta_{ik} y_{i,t-k} + \sum_{k=1}^{K} \gamma_{ik} x_{i,t-k} + \varepsilon_{i,t} \tag{3}$$

where $x_{i,t}$ and $y_{i,t}$ are the observations of two stationary variables for individual i in period t. Coefficients are allowed to differ across individuals (note the i subscripts attached to the coefficients) but are assumed time invariant. The lag order K is assumed to be identical for all individuals and the panel must be balanced.

As in Granger (1969), the procedure to determine the existence of causality is to test for significant effects of past values of x on the present value of y. The null hypothesis is therefore defined as:

$$H_0 : \gamma_{i1} = \cdots = \gamma_{iK} = 0 \quad \forall i = 1, \ldots, N \tag{4}$$

Which corresponds to the absence of causality for all individuals in the panel? The test assumes there can be causality for some individuals but not necessarily for all. The alternative hypothesis thus writes:

$$\begin{aligned} H_1 &: \gamma_{i1} = \cdots = \gamma_{iK} = 0 \quad \forall i = 1, \ldots, N_1 \\ &\gamma_{i1} \neq 0 \text{ or } \ldots \text{ or} \gamma_{iK} \neq 0 \quad \forall i = N_1 + 1, \ldots, N_1 \end{aligned}$$

where $N_1 \in [0, N-1]$ is unknown. If $N_1 = 0$, there is causality for all individuals in the panel. N_1 is strictly smaller than N, otherwise there is no causality for all individuals and H_1 reduces to H_0.

Against this backdrop, DH propose the following procedure: run the N individual regressions implicitly enclosed in (3), perform F-tests of the K linear hypotheses $\gamma i_1 = \cdots = \gamma_{iK} = 0$ to retrieve W_i, and finally compute W as the average of the N individual Wald statistics:

$$\bar{W} = \frac{1}{N}\sum_{i=1}^{N} W_i \tag{5}$$

where W_i is the standard adjusted Wald statistic for individual $_i$ observed during T periods.[1] We emphasize that the test is designed to detect causality at the panel-level, and rejecting H_0 does not exclude that there is no causality for some individuals. Using Monte Carlo simulations, DH show that W is asymptotically well-behaved and can genuinely be used to investigate panel causality. Under the assumption that Wald statistics Wi are independently and identically distributed across individuals, it can be showed that the standardized statistic Z when $T \to \infty$ first and then $N \to \infty$ (sometimes interpreted as "T should be large relative to N") follows a standard normal distribution:

$$\bar{Z} = \sqrt{\frac{N}{2K}} \cdot \left(\bar{W} - K\right) \underset{[T,N\to\infty]}{\overset{d}{\longrightarrow}} \mathcal{N}(0,1) \tag{6}$$

Also, for a fixed T dimension with $T > 5 + 3K$, the approximated standardized statistic $\tilde{Z}$ follows a standard normal distribution:

$$\tilde{Z} = \sqrt{\frac{N}{2K} \cdot \frac{T-3K-5}{T-2K-3}} \cdot \left[\frac{T-3K-3}{T-3K-1} \cdot \bar{W} - K\right] \underset{[N\to\infty]}{\overset{d}{\longrightarrow}} \mathcal{N}(0,1) \tag{7}$$

The testing procedure of the null hypothesis in (4) is finally based on Z and Ze. If these are larger than the corresponding normal critical values, then one should reject H_0 and conclude that there is Granger causality. For large N and T panel datasets, Z^- can be reasonably considered. For large N but relatively small T datasets, Ze should be favored. Using Monte Carlo simulations, DH have shown that the test exhibits very good finite sample properties, even with both T and N small.

4.2 Panel data estimation

"The term "Panel data" refers to the pooling of observations on a cross-section of households, countries, firms over several time periods achieved through survey. Panel data (also recognized as longitudinal or cross-sectional time-series data) is a dataset in which the behaviors of objects are pragmatic over the period of time. These objects include countries, corporations, individuals, states, etc. The predominant benefits of Panel data includes: (a) it control for individual heterogeneities (See footnote 1). (b) more informative, shows more disparity, less collinearity among variables and more efficient data with additional degrees of freedom (c) it is more appropriate method for investigating adjustment dynamics (d) Furthermore, panel data is more effective for indicating and quantifying properties that are not easily tailored by cross sectional or time series data sets. (e) Lastly, panel data models have capacity to develop and analyze complex behavioral models in social sciences. (Baltagi Book, KSU)

[1] It is suggested by panel data that individuals are heterogeneous (Jawad and Naz 2018). Time series as well as cross sectional data studies do not control for these heterogeneities and hence result into biased results. Moulton (1986).

Panel data analysis considers models with large time spans (T) due to readily availability of data. The latest work on dynamic heterogeneous panel valuation with large N and T, proposes different procedures for assessment (a) fixed effect estimation method allows to pool time series data for each cross section along with permission of variation for intercept terms. However, it the provides misleading results if slope coefficients are not identical (b) in addition to this, in Mean Group (MG) estimator model is built separately for each cross section and arithmetic mean of coefficients is obtained (Pesaran et al. 1999).

MG technique allows the intercepts, slope coefficients, and error variances to diverge across cross sections. (c) Pesaran et al. (1999) (Pesaran and Pesaran 1997) propose a new procedure based on combination and averaging of coefficients named as Pooled Mean Group (PMG) with an assumption to measure nonstationary dynamic panels. It allows short run parameters, intercepts terms and error variance to vary across groups (as in MG estimator). However, it detains long run coefficients to be same.

Experimental description of PMG model is as follows

$$y_{it} = \sum_{j=1}^{p} \lambda_{ij} y_{i,t-j} + \sum_{j=0}^{q} \delta_{ij} X_{i,t-j} + \mu_t + \varepsilon_{it}$$

where no of cross sections i = 1, 2, …. N and time t = 1, 2, 3 …. T. It X is a vector of K × 1 regressors, λ_{ij} is a scalar, μ_i is a group specific effect. If the variables are I(1) and co-integrated then the disturbance term is an I(0) process, Equation after re-parameterize into the error correction is as follows

$$\Delta Y_{it} = \phi_i y_{i,t-j} - \theta_i X_{i,t-j} \sum_{j=1}^{p-1} \lambda_{ij} \Delta y_{i,t-j} + \sum_{j=0}^{q-1} \delta_{ij} \Delta X_{i,t-j} + \mu_t + \varepsilon_{it}$$

The error correction parameter ϕ_i indicates the speed of adjustment. If $\phi_i = 0$, then there is no evidence that variables have long run association. It is expected that ϕ_i is negative and statistically significant under the prior supposition that variables indicate a convergence to long run equilibrium in case of any disturbance.

The results of Panel unit root tests indicate that all the study variables are stationary at level and first difference and order of integration was I(1) and I(0) (Pesaran et al. 2001). So Panel ARDL appears to be more appropriate technique for estimation in present circumstances (Jawad et al. 2018).

5 Results and analysis

Results are discussed in two sections. The section one describes correlational matrix and descriptive of statistics followed by section two showing results of Granger Causality Test and Panel ARDL estimation.

5.1 Inter correlational matrix

The results of the correlational matrix have been narrated in Table 1 after applying spearman's bivariate correlation (r). The findings report the individual coefficient of correlation between the dependent variable i.e. Industrial development (IVA) and independent variables i.e. Trade Openness (TO), Inflation (INF), governance (GOV),

Table 1 Inter correlation matrix. *Source*: Author's calculation

	IVA	TO	INF	GOV	FDI	EO	DC	CAO
IVA	1							
TO	0.143	1						
INF	0.099	−0.001	1					
GOV	0.460	0.059	−0.113	1				
FDI	−0.298	0.016	0.245	0.196	1			
EO	0.678	0.198	0.252	−0.069	−0.064	1		
DC	0.250	0.1347	0.398	−0.100	0.203	0.4746	1	
CAO	0.123	−0.041	0.061	−0.400	0.111	−0.039	−0.294	1

IDV industrial value added, *GOV* governance, *CAO* capital account openness, *EO* equity openness, *TO* trade openness, *DC* domestic credit, *FDI* foreign direct investment, *INF* inflation

Foreign Direct Investment (FDI), Equity Openness (EO), Capital Account Openness (CAO) and Domestic Credit Available to Private Sector (DC) of the study. The results reported strong positive correlation between Equity Openness (EO) and Industrial Development (IVA) while the correlation between Governance (GOV) and Industrial Development (IVA) is positive and moderate. Moreover, our surprising observation in this matrix includes a negative correlation between Foreign Direct Investment (FDI) and Industrial development (IVA) indicators.

5.2 Summary statistics

Extending the statistical analysis the Table 2 below highlights the description of summary statistics of variables under study.

The statistical analysis has been further extended by performing descriptive examination of all study variables along with all dimension of Governance. For this purpose, the sample period has been divided into two sub periods. The breakpoint for sample period is 2002 when second phase of liberalization has been implemented. Table 2 reported wide range of variation in both sub sample periods. The comparison of the average values illustrates that Industrial Development in South Asian Economies increase by only 0.8% in second period demonstrating that no significant variation has been observed in Industrial Development even after implementation of second phase of liberalization. The mean and standard deviation of Governance indicator along with its individual dimensions have also been presented. The statistics show that overall Governance structure become worse in second period along with it the different dimensions of governance also report poor performance in second phase of liberalization.

Furthermore, financial markets and stock markets become more liberalized however no significant improvement has been observed in Trade Openness in second period. Finally, the statistics show that FDI increased 6.25% and Domestic Credit Available to Private Sector increase 14.4% however, a change of 3.77% has been observed in inflation among two periods. The findings of descriptive analysis are interesting hence encouraging to conduct more rigorous analysis to find out the impact of different determinants i.e. Capital Account Openness, Trade Openness, Equity Openness, Governance, FDI, Inflation and Domestic Credit Available to Private Sector on Industrial Development.

Table 2 Summary statistics of the variables. Source: Authors calculation

	Mean	SD	Maximum	Minimum
Sub period (1996–2002)				
CAO	0.624071	3.155957	9.284188	−1.18876
EO	10.95971	8.521111	34.15482	−5.32375
TO	0.633461	0.427559	1.704314	0.215515
GOV	−0.34683	0.455007	0.556734	−1.00167
VA	−0.44391	0.445916	0.403649	−1.32
GE	−0.12324	0.549221	0.910108	−0.76
PS	−0.67476	0.996742	1.113783	−2.09
RL	−0.2061	0.488186	0.527348	−0.96197
RQ	−0.28971	0.547342	1.001801	−1.06083
CC	−0.34325	0.513314	0.720499	−1.18
FDI	0.851946	0.861938	3.573782	−0.19128
INF	6.029986	3.778693	15.93583	−1.40425
DC	22.24285	6.859493	32.74327	6.675086
IDV	21.78019	2.402808	25.56525	17.87065
Sub period (2003–2015)				
CAO	1.235339	4.481789	13.87346	−1.18976
EO	22.88741	21.54203	98.8937	−8.12474
TO	0.694655	0.486341	2.045854	0.178535
GOV	−0.49594	0.43052	0.371621	−1.18
VA	−0.46645	0.457965	0.458752	−1.26
GE	−0.32163	0.426014	0.618594	−1.04
PS	−0.8906	1.112854	1.303556	−2.81
RL	−0.33452	0.468198	0.509776	−1.02
RQ	−0.52944	0.356187	0.565984	−1.19459
CC	−0.43299	0.602544	1.274812	−1.49
FDI	7.104548	4.703183	22.5645	−18.1086
INF	2.264275	3.029907	17.28995	−0.07351
DC	36.70144	12.41819	64.74901	12.98403
IDV	22.66217	2.48129	27.06027	18.68462

IDV industrial value added, *GOV* governance, *CAO* capital account openness, *EO* equity openness, *TO* trade openness, *DC* domestic credit, *FDI* foreign direct investment, *INF* inflation, *VA* voice and accountability, *RL* rule of law, *GE* government effectiveness, *PS* political stability, *RQ* regulatory quality, *CC* control of corruption

Followed by summary statistics, section two describes the findings of Granger Causality Test and Panel ARDL Short run and Long run estimates.

5.3 Granger causality test

Table 3 reports the results of Dumitrescu–Hurlin Panel Granger Causality Test. The findings show a bidirectional causal relationship of all independent variables with industrial development separately between the years 1996 to 2015 in South Asia economies. Statistics shows that Industrial Development does not cause Capital Account Openness because the $p < 0.05$ therefore we reject the null hypotheses however; Capital Account Openness

Table 3 Dumitrescu–Hurlin panel Granger causality test results. Source: Authors calculation

Direction of causality	F-statistics	Prob
IDV does not cause CAO	3.87466	0.0234
CAO does not cause IDV	0.28416	0.7532
IDV does not cause TO	3.08071	0.0496
TO does not cause IDV	0.04890	0.9523
IDV does not cause EO	8.47001	0.0004
EO does not cause IDV	0.08285	0.9205
IDV does not cause INF	2.53170	0.0838
INF does not cause IDV	0.50131	0.6070
IDV does not cause DC	0.16289	0.8499
DC does not cause IDV	2.49279	0.0470
IDV does not cause FDI	1.46709	0.2347
FDI does not cause IDV	3.92260	0.0224
IDV does not cause GOV	1.44530	0.2397
GOV does not cause IDV	0.79356	0.4546

IDV industrial value added, *GOV* governance, *CAO* capital account openness, *EO* equity openness, *TO* trade openness, *DC* domestic credit, *FDI* foreign direct investment, *INF* inflation

causes Industrial Development. This causality is observed at the 5% significance level therefore we accept null hypotheses. The findings show that easing restrictions on capital flows across national borders causes Industrial Development in SAARC countries. Likewise, results further demonstrate that Industrial Development does not cause Trade Openness because the $p < 0.05$ therefore we reject the null hypotheses however, Trade Openness cause Industrial Development. This causality is observed at the 5% significance level therefore we accept null hypotheses. The results indicate that industrial growth in SAARC countries is caused by the Trade Openness and that a boost in industrial performance is because of increased Trade Openness.

Similarly, Industrial Development does not cause Equity Openness because the $p < 0.05$ therefore we reject the null hypotheses however, Equity Openness causes Industrial Development and the causality is observed at the 5% significance level therefore we accept null hypotheses. The findings show that developed stock markets and increased cross-border equity flows causes Industrial Development in SAARC countries. Furthermore, statistics shows that Industrial Development causes Domestic Credit Availability to Private sector and the causality is observed at the 5% significance level therefore we accept null hypotheses but Domestic Credit Availability does not cause Industrial Development because the $p < 0.05$ therefore we reject the null hypotheses. Henceforth, unidirectional causality running from industrial growth to Domestic Credit Avaibility to Private sector exists which shows that Industrial Development will have a major impact on lending activities of private sector meaning that demand following hypothesis is true for SAARC countries.

Correspondingly, findings further validate that Industrial Development does not cause FDI because the $p < 0.05$ therefore we reject the null hypotheses however, FDI cause Industrial Development and the causality is observed at the 5% significance level therefore we accept null hypotheses because FDI has been considered as a major source of capital accumulation which in turn leads to industrial growth in a recipient economy. Lastly, the findings show that Industrial Development causes Inflation and Inflation causes Industrial

Development and the causality is observed at the 5% significance level therefore we accept null hypotheses. Because high Industrial Development indicates lower unemployment rate, improved labor wages causing high demand for manufactured goods ultimately causes growth in general price level of goods or simply inflation. In contrast to this, sometimes increased demand of goods in the face of decreased supply also quickly forces prices up therefore encouraging for more industrial production causing growth of industry. Likewise, Industrial Development cause Governance and Governance also causes Industrial Development and the causality is observed at the 5% significance level therefore we accept null hypotheses. The increased Governance in a country indicates better implementation of rule of law, control of corruption, political stability, regulatory quality and government effectiveness causing low production cost and high Industrial Development. In contrast to this high Industrial Development lead to high tax provisions causing low corruption and better regulatory quality and ultimately improved Governance in a country.

5.4 Short run results of panel auto regressive distributed lag (ARDL) technique

The present section discusses the short run results of Panel ARDL in detail (Table 4).

Table above narrates the results of short Run analysis of Bangladesh. Statistics shows that the coefficient of error correction term is negative and is statistically significant in all specifications (-0.014720, $p=0.001$) which is correct theoretically. The speed of adjustment to shock or destabilization is around 1.4 percent in each specification which shows that the external shocks, poor stabilization policies or discomfort existing in the industrial sector of Bangladesh will continue to prevail for next years and the current industrial policy being followed is not effective. The predominant reason might include increased investment but without verification of sources of funds, increased corruption, black money, poor Governance, high trade deficit, lack of provision of quality services to citizens dependence on foreign loan for production and operations and existence of only small and cottage industry (Table 5).

Table 4 Panel ARDL short run results Bangladesh

Variable	Coefficient	Std. Error	t-Statistic	Prob. *
COINTEQ 01	−0.014720	0.001241	−11.86487	0.0013
D(TO)	−0.056624	0.042348	−1.337119	0.2735
D(GOV)	0.076980	0.002141	35.94945	0.0000
D(FDI)	0.013537	0.000552	24.50241	0.0001
D(EO)	−0.000720	7.08E−07	−1016.632	0.0000
D(DC)	−0.000976	2.98E−05	−32.78368	0.0001
D(CAO)	1.224940	46.80791	0.026170	0.9808
D(INF)	0.004349	7.16E−06	607.7333	0.0000
C	0.351710	0.619657	0.567588	0.6100
@TREND	0.007310	6.35E−06	1152.078	0.0000

Level of significance 5%

IDV industrial value added, *GOV* governance, *CAO* capital account openness, *EO* equity openness, *TO* trade openness, *DC* domestic credit, *FDI* foreign direct investment, *INF* inflation

Table 5 Panel ARDL short run results Bhutan

Variable	Coefficient	Std. Error	t-Statistic	Prob. *
COINTEQ 01	−0.984380	0.000101	−9744.598	0.0000
D(TO)	−0.333589	0.016069	−20.75993	0.0002
D(GOV)	0.284666	0.031760	8.963013	0.0029
D(FDI)	0.020416	0.000140	146.2567	0.0000
D(EO)	−0.019439	2.79E−05	−697.7493	0.0000
D(DC)	0.015784	3.04E−05	518.4161	0.0000
D(CAO)	−4.664371	3.725996	−1.251845	0.2993
D(INF)	−0.015334	2.93E−05	−523.9121	0.0000
C	18.23391	0.140593	129.6932	0.0000
@TREND	0.124049	4.09E−05	3032.379	0.0000

Level of significance 5%

IDV industrial value added, *GOV* governance, *CAO* capital account openness, *EO* equity openness, *TO* trade openness, *DC* domestic credit, *FDI* foreign direct investment, *INF* inflation

Table above narrates the results of short Run analysis of Bhutan. Statistics shows that the coefficient of error correction term is negative and is statistically significant (−0.984380, $p=0.0000$). Therefore suggesting that model converges towards equilibrium. The speed of adjustment to shock or destabilization is around 98% in each specification showing that the current industrial policy being followed is effective and progressive. The predominant reason includes better Governance structure, political stability, government effectiveness, rule of law and regulatory quality, increased percentage of private investment as a share of GDP, increased Domestic Credit available to Private sector, constant Inflation, improved GDP growth (Table 6).

Table above narrates the results of Short Run analysis of India. Statistics shows that the coefficient of error correction term is negative and is statistically significant as well in all specifications (−0.047660, $p=0.03130$). Therefore suggesting that model does not converges towards equilibrium. The speed of adjustment to shock or destabilization is around

Table 6 Panel ARDL short run results India

Variable	Coefficient	Std. Error	t-Statistic	Prob. *
COINTEQ 01	−0.047660	0.039398	−1.209717	0.03130
D(TO)	−0.006992	0.000763	−9.162887	0.0027
D(GOV)	−0.138090	0.131243	−1.052165	0.3700
D(FDI)	0.102662	0.000844	121.5720	0.0000
D(EO)	−0.001453	1.33E−06	−1096.087	0.0000
D(DC)	0.036914	0.000163	226.1798	0.0000
D(CAO)	−45.75566	319.2354	−0.143329	0.8951
D(INF)	0.030736	7.04E−05	436.3583	0.0000
C	1.186587	24.61532	0.048205	0.9646
@TREND	0.007802	0.000293	26.62587	0.0001

Level of significance 5%

IDV industrial value added, *GOV* governance, *CAO* capital account openness, *EO* equity openness, *TO* trade openness, *DC* domestic credit, *FDI* foreign direct investment, *INF* inflation

Table 7 Panel ARDL short run results Maldives

Variable	Coefficient	Std. Error	t-Statistic	Prob. *
COINTEQ 01	−0.332060	0.019299	−17.20572	0.0004
D(TO)	−0.167095	0.017117	−9.762074	0.0023
D(GOV)	0.180262	0.042624	4.229072	0.0242
D(FDI)	0.006540	0.000131	49.75820	0.0000
D(EO)	−0.000630	7.67E−06	−82.11175	0.0000
D(DC)	−0.008707	5.40E−05	−161.1732	0.0000
D(CAO)	0.144365	0.032304	4.469018	0.0209
D(INF)	0.009493	0.000209	45.36596	0.0000
C	5.869604	6.308312	0.930456	0.4208
@TREND	0.015400	7.71E−05	199.8518	0.0000

Level of significance 5%

IDV industrial value added, *GOV* governance, *CAO* capital account openness, *EO* equity openness, *TO* trade openness, *DC* domestic credit, *FDI* foreign direct investment, *INF* inflation

Table 8 Panel ARDL short run results Nepal

Variable	Coefficient	Std. Error	t-Statistic	Prob. *
COINTEQ 01	−0.146377	0.004404	−33.23470	0.0001
D(TO)	0.097785	0.018736	5.219220	0.0137
D(GOV)	−0.077591	0.006867	−11.29987	0.0015
D(FDI)	0.254264	0.005939	42.81447	0.0000
D(EO)	−0.007366	1.30E−05	−568.5965	0.0000
D(DC)	0.007215	1.46E−05	493.2714	0.0000
D(CAO)	−2.719630	89.46778	−0.030398	0.9777
D(INF)	0.014694	3.16E−05	465.0153	0.0000
C	2.951539	1.790224	1.648698	0.1978
@TREND	0.008297	1.12E−05	743.5980	0.0000

Level of significance 5%

IDV industrial value added, *GOV* governance, *CAO* capital account openness, *EO* equity openness, *TO* trade openness, *DC* domestic credit, *FDI* foreign direct investment, *INF* inflation

4.7% in each specification which shows that the external shocks, poor stabilization policies or discomfort existing in the industrial sector of India will continue to prevail for coming years and the current industrial policy being followed needs revision. The predominant reason might include lack of control on financial markets and institutions, increased interest rate, and increased corruption, black money, poor Governance, lack of accountability and absence of quality services to citizens (Table 7).

Table above narrates the results of Short Run analysis of Maldives. Statistics shows that the coefficient of error correction term is negative and is statistically significant (-0.332060, $p=0.0004$). Therefore suggesting that model does not converges towards equilibrium. The speed of adjustment to shock or destabilization is around 33% in each specification which shows that the external shocks, poor stabilization policies or discomfort existing in the industrial sector of Maldives will continue to prevail for next couple of

Table 9 Panel ARDL short run results of Pakistan

Variable	Coefficient	Std. Error	t-Statistic	Prob. *
COINTEQ 01	−0.248302	0.036002	−6.89689	0.0001
D(TO)	−0.154466	0.027098	−5.700198	0.0107
D(GOV)	0.647002	0.031276	20.68692	0.0002
D(FDI)	0.032609	0.000390	83.65450	0.0000
D(EO)	−0.001999	3.73E−06	−536.1118	0.0000
D(DC)	0.012533	4.39E−05	285.6473	0.0000
D(CAO)	0.015386	7.04E−05	218.6065	0.0000
D(INF)	−0.018155	3.29E−05	−551.9596	0.0000
C	23.96446	18.83245	1.272509	0.2929
@TREND	−0.089394	0.011016	−8.114603	0.0039

Level of significance 5%

IDV industrial value added, *GOV* governance, *CAO* capital account openness, *EO* equity openness, *TO* trade openness, *DC* domestic credit, *FDI* foreign direct investment, *INF* inflation

Table 10 Panel ARDL short run results Sri Lanka

Variable	Coefficient	Std. Error	t-Statistic	Prob. *
COINTEQ 01	−0.185418	0.006713	−27.61995	0.0001
D(TO)	0.325192	0.011404	28.51677	0.0001
D(GOV)	0.199727	0.028253	7.069277	0.0058
D(FDI)	0.005099	0.000188	27.12419	0.0001
D(EO)	0.005696	2.53E−05	225.0316	0.0000
D(DC)	−0.010767	3.05E−05	−352.8966	0.0000
D(CAO)	−0.020728	0.001667	−12.43646	0.0011
D(INF)	0.008098	1.82E−05	445.5811	0.0000
C	3.948942	2.993122	1.319339	0.2787
@TREND	0.026692	7.72E−05	345.9708	0.0000

Level of significance 5%

IDV industrial value added, *GOV* governance, *CAO* capital account openness, *EO* equity openness, *TO* trade openness, *DC* domestic credit, *FDI* foreign direct investment, *INF* inflation

years and the current industrial policy being followed is in effective and needs revision. The predominant reason might include increased poor Governance, political instability, rule of law, lack of regulatory quality, high trade deficit, deteriorating current account deficit, decreased external financial inflows, balance of payment crisis and low foreign reserves (Table 8).

Table above narrates the results of Short Run analysis of Nepal. Statistics shows that the coefficient of error correction term is negative and is statistically significant as well in all specifications (−0.146377, $p=0.0001$). Therefore suggesting that model does not converges towards equilibrium. The speed of adjustment to shock or destabilization is around 14.6% in each specification which shows that the external shocks, poor stabilization policies or discomfort existing in the industrial sector of Nepal will continue to prevail for next couple of years and the current industrial policy being followed needs revision.

Table 11 Panel ARDL short run results of results: dependent variable (industrial development)

Variable	Coefficient	Std. Error	t-Statistic	Prob. *
COINTEQ 01	−0.422702	0.185490	−2.278838	0.0261
D(TO)	−0.042255	0.080049	−0.527870	0.5994
D(GOV)	0.167565	0.098380	1.703250	0.0935
D(FDI)	0.062161	0.034460	1.803871	0.0760
D(EO)	−0.003702	0.002991	−1.237710	0.2204
D(DC)	0.007428	0.006225	1.193304	0.2372
D(CAO)	−7.396529	6.438898	−1.148726	0.2550
D(INF)	0.004840	0.006429	0.752833	0.4544
C	8.072393	3.487788	2.314474	0.0239
@TREND	0.014308	0.023442	0.610368	0.5438

Level of significance 5%

IDV industrial value added, *GOV* governance, *CAO* capital account openness, *EO* equity openness, *TO* trade openness, *DC* domestic credit, *FDI* foreign direct investment, *INF* inflation

The predominant reason might include poor accounting and auditing standards, increased corruption, lack of competition, poor Governance, high trade deficit and macroeconomic instability (Table 9).

Table above narrates the results of short Run analysis of Pakistan. Statistics shows that the coefficient of error correction term is negative and is statistically significant (-0.248302, $p=0.0001$). Therefore suggesting that model does not converges towards equilibrium. The speed of adjustment is around 26.4% in each specification which shows that the external shocks, poor stabilization policies or discomfort existing in the industrial sector of Pakistan will continue to prevail for next couple of years and the current industrial policy being followed is not effective. The predominant reason might include poor governance, ineffective accounting and auditing standards, increased corruption and macroeconomic instability (Table 10).

Table above narrates the results of short Run analysis of Sri Lanka. Statistics shows that the coefficient of error correction term is negative and is statistically significant as well in all specifications (-0.185418, $p=0.0001$). Therefore suggesting that model does not converges towards equilibrium. The speed of adjustment to shock is around 18% in each specification. Which shows that the external shocks, poor stabilization policies or discomfort existing in the industrial sector of Sri Lanka will continue to prevail for couple of years and the current industrial policy being followed is not effective? The predominant reason includes existence of civil war in the country causing high political risk, increased corruption, poor Governance status, political instability, poor credit allocation, macroeconomic instability (Table 11).

Table above narrates the results of Short Run analysis of dependent variable (Industrial Development). Statistics shows that the coefficient of error correction term is negative and is statistically significant as well in all specifications (-0.422702, $p=0.0261$). Therefore suggesting that model converges towards equilibrium. The speed of adjustment is 42% in each specification. Which shows that the external shocks, poor stabilization policies or discomfort existing in the industrial sector of South Asian economies will continue to prevail for next couple of years and the current industrial policy being followed is not effective and needs revision. The predominant reason observed include increased poor Governance,

Table 12 Panel ARDL (1, 1) long run results

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
Long run equation				
TO	0.135918	0.121704	1.116794	0.2683
GOV	0.983768	0.203758	4.828113	0.0000
FDI	−0.038069	0.013768	−2.765111	0.0075
EO	0.005902	0.001563	3.775419	0.0004
DC	0.002801	0.002275	1.231159	0.2228
CAO	0.391876	0.238657	1.642001	0.1056
INF	0.021960	0.005013	4.380284	0.0000

political instability, and lack of rule of law and regulatory quality and macroeconomic instability in the region as a whole.

5.5 Long run results of panel autoregressive distributed lag (ARDL)

Table 12 reports the results of the Panel Autoregressive Distributed Lag (ARDL) cointegrating technique or bound cointegrating technique. Panel ARDL bounds testing approach was applied on three basis. First, Pesaran et al. (2001) recommended its utilization for investigating level of associations because the model advocates that when the order of the ARDL has been identified, the association can be calculated by OLS. Secondly, Autoregressive Distributed Lag (ARDL) cointegrating technique permits a combination of order of integration I(1) and I(0) variables as predictors. The order of integration of study variables may not necessarily be the same or is a combination of both i.e. I(0), I(1). Therefore, it does not require explicit inquiry of order of integration. Thirdly, it is appropriate for small or limited sample size. The selected lag length is maximum 3 for difference variable for estimation of ARDL equation.

The null and alternative hypotheses are as follows:

$$H_0 = \beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = \beta_6 = \beta_7 \text{ (no long - run relationship)}$$

Against the alternative hypothesis

$$H_1 = \beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = \beta_6 = \beta_7 \text{ (a long - run relationship exists)}$$

The table above explains the long-run estimates of the study model. The estimated coefficient shows that Governance shows a significant and positive effect on Industrial Development. The findings signified that better Governance structure contributed significantly in growth of Industrial Development of the South Asian Region.

Numerous studies narrated that better Governance provides opportunities, incentives and penalties which act as a catalyst and contribute significantly in prompting the industrial development of an economy. Moreover studies also contented that improved Governance structure of a country promotes the efficient resource allocation to the public and private sector of economy to enhance the market functioning. Likewise better Governance structure promotes industrial development by reducing level of corruption, improved accountability and government effectiveness in the country. Furthermore, researchers narrated that countries having better Governance structure are well equipped with updated market information which provide friendly business environment and

encourages Foreign Investment in the country which indirectly contributes in growth of Industrial Development of economy. Same findings were narrated by Knack and Keefer (1997), Rodrik (2004), Bardhan (2005). Similarly Rivera-Batiz (2002), Haber and Musacchio (2004) also reported that political stability, strong legal institutions and democracy were in fact a significant determinant of Industrial Development but only if the democratic institutions ensure implementation of quality of Governance in the country. Amavilah (2008) and Cooray (2009) also emphasized the importance of Governance for Industrial Growth in developing countries. Therefore, there is dire need to improve the Governance structure of SAARC economies in order to promote the Industrial Development of the region and instigate overall Economic development.

The findings of the Long run estimates further reported negative and significant effect of FDI on Industrial Development of SAARC economies. The findings are in line with the results of Schoors and Van Der Tol (2002), Stanisic (2015) and Görg and Greenaway (2004) who suggested negative impact of FDI on Industrial Development of host countries. This could happen through repatriation of profit and market stealing effect. Moreover Chen et al. (1995) reported that FDI brings superior endowments of technology and management skills in the host country which makes the domestic industry prone to fierce market competition ultimately building pressure for the local industries to invest in research and development activities which otherwise would hurt the development and growth of industry. Moreover, Reis (2001) also reported negative impact of FDI on Industrial Growth as it decreases domestic welfare of the host country due to the transfer of capital returns to foreign firms. Firebaugh (1992) also evidenced that FDI decreases domestic industry growth as it discourages local entrepreneurship and development of linkages with domestic firms and by stimulating inappropriate consumption pattern. Alfaro et al. (2004) studied the impact of FDI on growth and notified ambiguous effect in the primary, manufacturing and service sectors and. Likewise Aitken and Harrison (1999) evidenced negative impact of FDI on productivity of domestic firms in manufacturing industry in Venezuela.

Furthermore, the results of the Long run estimates showed the Equity Openness has significant and positive effect on the Industrial Development of the South Asian Economies. Increased liberalization and financial integration after the implementation of structural adjustment program (SAP) in South Asian economies rapidly increased Market Capitalization and the value traded. The results are in line with the findings of Levine and Zervos (1998), Rajan and Zingales (1996), Goldsmith (1969), Mckinnon (1973) and Shaw (1973) who reported significant impact of stock market development on the firms operations in the industrial sector. Likewise, Montiel (1994) and Greenwood and Jovanovic (1990) evidenced that efficient stock market ensures provision of finance for high-return, industrial projects. Becsi and Wang (1997) also highlighted the equity market can increase productivity in the industrial sector by distributing resources more professionally to profitable long-term investments. Bencivenga et al. (1996) and Demirgüç-Kunt and Levine (1996) demonstrated that an extremely liquid equity market enables industries to have access to long-term funds for performance of their production and operations efficiently ultimately boosting their long term industrial growth. Moreover, Levine and Zervos (1998) showed that well-developed stock market provides opportunities for portfolio diversification to minimize investment risk which accelerates the provision of long term funds to the industries for growth and development.

Kyle (1984) and Holmström and Tirole (1993) reported that liquid and well-performing equity market develops occupational control, better staff monitoring and stimulates

information acquisition about firm and improves corporate governance which ultimately causes improved performance of the industry. Finally, universally unified equity market encourages Industrial Development by improving capital inflows. Financial liberalization and equity market integration causes free movement of capital to align the price of risk. Equity Openness leads to availability of liquid cash, risk diversification and effective resources allocation. Saint-Paul (1992), Devereux and Smith (1994) and Obstfeld and Rogoff (1994) reported rapid rate of Industrial Development due to stock market development after financial market integration.

Lastly, the findings of the Long run estimates further reported positive and significant effect of Inflation on Industrial Development of South Asian Economies. The findings are in line with Mallik and Chowdhury (2001) Likewise, Ghosh and Phillips (1998), Mundell (1963) and Tobin (1965) who also evidenced a positive association between Inflation and growth in 145 countries. Mallik and Chowdhury (2001) showed positive relationship between the aforementioned variables in a sample collected from selected South Asian countries. Logue and Sweeney (1981) and Mubarik and Riazuddin (2005) found positive relation between Inflation and Economic Growth in twenty four countries including Pakistan. Moreover, Tobin (1965) reported higher Inflation increases capital accumulation ultimately causing long-run development. Wang Zhiyong (2008) further signified positive relationship by using co-integration and error correction model. Odhiambo (2009) who examined Short Run and Long Run causal relationship between Inflation, investment, and growth in Tanzania by ARDL-bounding testing approach the study reported unidirectional causal flow from Inflation to development.

6 Study conclusion

In current era, researches related to finance and growth nexus have been an issue of thoughtful and contentious discussion among policy makers and researchers. In this context, numerous policy makers and researchers across the globe are making attempts to explore the mechanism through which the financial sector openness effects the deployment of resources and in turn economic development. Emerging economies across the globe implemented extensive financial policy reforms on the direction of IMF and World Bank to stabilize their economies. Furthermore, high interest rate in stabilization policies facilities more saving and convenient access to credit at individual as well as firm level in turn enhancing investment. The easy availability of credit escalates the competition among firms in the domestic market ultimately effecting industrial sector and real sector of economy. Henceforth, the mechanism of impact of financial liberalization on industrial sector requires certain well performing working institutions, better governance measures along with stable macroeconomic conditions. Therefore, there is a dire need to identify the channel through which significant amount of industrial development could be achieved in present era. The objective of the current research was to investigate impact, direction and magnitude of different determinants of industrial development in SAARC economies. Findings showed significant negative impact of FDI on Industrial Development of South Asian economies. However, Equity Openness, Governance and Inflation have significant positive impact on the industrial development of the SAARC economies.

7 Study recommendations

Therefore, from the policy perspective the study recommends that appropriate FDI investment policies should be designed in the SAARC economies such that it may not hurt the growth of the local industry and must generate positive sense of competition among the domestic and foreign industries to enhance exports, promote entrepreneurial efforts, transfer management skills, develop linkages with domestic firms, invest in research and development activities, transfer of technology and expertise to boost the development of local industry.

Moreover, Governance conditions must be improved optimally in the SAARC economies in order to boost the development of industry in the region because maintenance of political stability, strong legal institutions, control of corruption, and rule of law, government effectiveness and democracy were in fact a custodian of Industrial Development. Likewise, more liquid equity markets enables provision of long term funds for industrial growth and development.

South Asian Economies needs to establish a transparent, broad and effective enabling policy environment for investment, even by making free trade zones like UAE, and to build the human and institutional capacities to implement them; however keeping local industry and employment of own human resource in view.

South Asian Economies should increase the flexibility of their financial system in order to gain the advantages of financial openness i.e. Capital Account Openness, Equity Openness and Trade Openness which will in turn boost industrial growth in the region. Comprehensive financial stabilization program, successfully implemented by Turkey in 80s might be followed to overcome trade deficit crisis, by having an 'Outward Oriented Development Strategy' aimed at financial openness and increased international trade by removing trade barriers and improving production of low cost products.

Furthermore, execution of a dynamic industrial policy to encourage Economic development and expansion, addressing business apprehensions through extensive public investments, well-secured property rights, promoting innovative businesses, targeted fiscal incentives and output growth as implemented by Singapore government could also contributes in promoting Industrial Development. Lastly, a societal prejudice of corruption in Singapore strongly undergirds the rule of law and contributes in better Governance therefore, if implemented can significantly impact growth of industry in South Asia.

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