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Labor Force Participation & Domestic Credit to Private Sector: Which One is Suitable for Industry Value Added?

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Abstract: *Labor Force Participation (LFP) and Domestic Credit for Business (DCB) initiatives are the integral components for the industrial progress. Through this study, the motivation is to explore the impact of LFP and DCB on the industrial value addition. The time series analysis was based upon secondary data of the range from 1980 to 2023. The Autoregressive Distributed Lag (ARDL) technique of regression estimates is followed for the purpose of analyses. The results confirm significant and positive relationship of LFP and DCB on industrial value added. However, the DCB is more impactful as compared to LFP. Hence it is concluded that the government ought to attempt in further improving the credit availability towards the industrial sector together with the facilitation and motivation of the labor force to have a concrete and potential efforts towards industry so that the target of economic growth and employment creation is achieved.*

Keywords: Labor Force Participation, Domestic Credit To Private Sector, Industry Value Added, ARDL, Pakistan

Introduction

Industrialization is a platform that engages the economy to move from the primarily agrarian economy to the mass-productivity and the manufacturing of technologically advanced goods and services. This phase is characterized by LFP and DCB together with the leaps in productivity, shift from the rural to the urban labor, and indeed the improvement in the living standard. The industry valued added is a sign of economic development in the human history which is based upon the typical measurements such as the per capita income and the labor productivity.

Industrial value addition is a captive towards the economic development of the world. The process of industrial moves has been improved by the merger of the strategies like of maximum labor participation supplemented by the availability of credit so that the living standards of the people is made better off. The major industrial shifts were recorded in the western economies during the industrial revolution oof 18th and 19th century. From China to Japan and United States to Great Britain, this era is exceptional in recording the economic growth and development at the back of industrial revolution (Boyle, 2023).

The manufacturing sector of Pakistan contributes significantly into the economy by accounting approximately 13 percent of the GDP and employing a substantial portion of the labor force. The key sectors including textile, chemicals, automotive, electronics, and food processing are the part of large-scale manufacturing sector. Manufacturing sector contributes into the employment creation and the labor force participation helps boosting up the manufacturing sector and assists in achieving the macroeconomic objectives such as employment creation, inflation controls, poverty alleviation, and trade improvements etc. as some of the many macroeconomic objectives. Of the overall industry, the large-scale accounts for 74.3 percent of the sectoral share out of which 25 percent share is embedded with the textile industry.

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However, challenges are at the upfront such as technology lapses, energy crises, the hurdles in the regulatory framework, and the lowest investment in the research and development.

The LFP is a key aspect to alter the smooth functioning of industrial sector. Being an integral part of the production function, the LFP rate in Pakistan has remained 52.58 percent in 2024. According to the World Bank, this figure is extracted from the collection of development indicators which are compiled from the officially recognized sources. In Table 1, the summary of the LFP is given. Lowest recorded LFP is during 2018 which is 50.99 percent oppositely, the 2021 is recorded for the highest LFP rate i.e., 52.73 percent. Since from 2022 to 2024, almost consistent LFP is documented.

Table 1

Year	Labor Force Participation Rate (15 years and above)
2015	52.03
2016	51.68
2017	51.34
2018	50.99
2019	51.59
2020	51.64
2021	52.73
2022	52.54
2023	52.57
2024	52.57

Source: World Bank; Trading Economics, 2024

DCB is meaningful in its impact on the industrial growth. the DCB particularly in Pakistan is reported to be 11.98 percent of the GDP in 2023 (World Bank, 2023). Table 2 highlights the records showing heightened amount of 16.63 percent of the GDP during 2018 to 2019. Consistent pace is recorded during 2020 onwards to 2021 and 2022 which is well above 15.03 percent of the GDP. It is found that during 2014 to 2019, there has been an increase in DCB from 14.03 percent to 16.63 percent.

Table 2

Year	Domestic Credit to Private Sector (% of GDP)
2015	14.03
2016	13.87
2017	14.68
2018	15.31
2019	16.63
2020	15.69
2021	15.03
2022	15.34
2023	14.83

Source: World Bank; Trading Economics, 2024

The motivation behind this study is to highlight the gap in the existing literature which addresses the intensity and direction of the relationship between LFP, DCB, and industrial value added. The study is captured in 5 sections. Where, Section I and Section II are allocated for the Introduction and Empirical Review. The Research Methodology and Interpretation of Results are given in Section III and Section IV. Finally, the Section V is allocated for the Conclusion and Policy Suggestions.

Empirical Review

Empirical view of the study area affirms that LFP along with physical capital hold a position of foundational drivers of the economic growth of particularly the developing economies like Pakistan (Umair, 2024). The LFP has a crucial role to play in the industrial sector of Pakistan (Umair, 2024). In support, Ali and Akhtar

(2024) found that the LFP is triggered by the mean of FDI, research and development expenditure, and the human capital.

The literature on industrialization and LFP in Nigeria is explored by Korgbeelo (2024) and Effiong and Udonwa (2024). The augmented Dickey Fuller test and Johansen cointegration test with error correction model together with Granger causality test were worked out by Korgbeelo (2024). The results revealed that manufacturing, mining, and quarrying sector output has significant positive effects on male LFP but negative on female LFP. The quality of education, healthcare, aptitude, and skills improve the LFP in a country (Ebhorta & Ugwu, 2014; Eromosele, 2023; Kalejaiye, 2022).

The amalgamated contents are located while the empirical view of the study is in-focused. For instance, Abbasi et al. (2021) diagnosed that energy consumption and the industrial growth altogether affect the economic growth of Pakistan. Similarly, Fatima et al. (2019) investigated two-way causality between energy consumption and economic performance.

At latest, Hameed et al. (2024) investigated the effects of institutional ownership on financial performance of the businesses in the textile sector of Pakistan. the generalized least squares and fixed and random effect models were used for the analytical purpose. The results concluded that the industrial performance is dependent upon complex factors' interplay. Therefore, the literature confirms that the industrial growth and value addition is quite vast in its horizons to understand its influence as a dependent or as an independent variable (Lee, 2008; Sanchez & Garcia, 2007).

The stakeholders who invest heavy capital protest their position in industry via improving the governance and performance of the industrial units (Cornett et al., 2003; Bushee, 1998). Business cum Industrial performance, institutional ownership, stock prices, managers' behavior, and corporate governance are strongly correlated (Pound, 1988; Krivogorsky, 2006; Nouravesh et al., 2006; Namazi and Kermani, 2008).

Another pose of the industrial sector is discussed by Mehmood et al. (2022) where the industrial value addition is traced for the effects on the economic growth. the findings based on ARDL confirmed that industrial value added and economic growth are long term correlated and in positive trend. Thomas et al. (2009) and Yang and Shafiq (2020) said that FDI and economic growth are related. However, Khan (2007) and Kobrin (2005) exclaimed that the embedded capacity of productivity enhancement, technological advances, and employment creation capacity are the captivates in leading to the industrial value addition-led-economic prosperity. The research by Chien et al. (2022), Hye et al. (2010) Sreenu (2022), and Zhang (2001) discovered that economic growth is impacted by FDI, oil prices, and industrialization.

Mehmood et al. (2022) carried out empirical research to notice the impact of industrial production and FDI on CO_2 emissions. The CO_2 emission is not an ignorable variable particularly for the developing countries like Pakistan (Mehmood et al., 2022). The ARDL based analyses authenticated that energy depletion, the industry value added, and FDI have negative impact on CO_2. Munir and Ameer (2019) found nonlinear effect of foreign investment, monetary development, and industrialization on CO_2. Improved and delicate industrial set ups are encouraging since there's no traces of CO_2 at the back of industrialization (Mehmood et al., 2022).

The empirics reviewed do authenticate that the industrial value added is significant variable. Hence, this study carries an objective to withstand industrial value added as to depend upon LFP and DCB. It is so because fewer studies locate the effects of LFP on industrial value added and DCB is still minute in the consideration of the empirics.

Research Methodology

Data Source and Description of Variables

This research is an attempt to investigate the impacts of LFP and DCB on the industrial value addition of Pakistan. For this purpose, LFP and DCB are the core independent variables used against the regressand which is industrial value addition. The study is based on the 43 years of the data length from 1980 to 2023. The Trading Economics and The World Bank Development Indicators are the sources from where the data is collected. The variables' descriptions are shown in Table 3.

Table 3

Variables' Descriptions

Variables	Notation	Description	Source of Data
Labor force participation	LFP	Foreign direct investment, net inflows (% of GDP)	World Bank Development Indictors
Inflation	INF	Consumer price index	Trading Economics
Population growth	PG	Population growth rate in %	World Bank Development Indicators
Domestic Credit to Private Sector	DCB	Domestic credit to private sector by banks (% of GDP)	World Bank Development Indictors
Exports of Goods & Services	EGS	Exports of goods and services (current LCU)	World Bank Development Indictors
Imports of Goods & Services	IGS	Imports of goods and services (current LCU)	World Bank Development Indictors
Industry Value Added	IND	Industry (including construction), value added (annual % growth)	World Bank Development Indictors

Model Specification

The model specification in terms of linear regression is shown in Eq. [1]$IN_t = \beta_0 + \beta_1 LFP_t + \beta_2 INF_t + \beta_3 PG_t + \beta_4 DCPS_t + \beta_5 EGS_t + \beta_6 IGS_t + \mu_t$

The β_0 is an intercept and μ_i is the error term.

The methodology of ARDL is valid for incorporation if the series is integrated of order I(0) or I(1) or a mixture of both except being at I(2). It is suitable due its authentic results computation (Mehmood et al., 2025a,2025b; Riaz et al., 2025) and therefore, advantageous on the Johansen and Engle and Granger Cointegration analyses.

The unrestricted, long run, and short run ARDL models are represented in Eq. [2] to Eq. [4], respectively.

$$\Delta IN_t = \beta_0 + \beta_1 IN_{t-1} + \beta_2 LFP_{t-1} + \beta_3 INF_{t-1} + \beta_4 PG_{t-1} + \beta_5 DCPS_{t-1} + \beta_6 EGS_{t-1} + \beta_7 IGS_{t-1} + \sum_{i=1}^{p} \partial_1 \Delta IN_{t-i} + \sum_{i=1}^{q} \partial_2 \Delta LFP_{t-i} + \sum_{i=1}^{q} \partial_3 \Delta INF_{t-i} + \sum_{i=1}^{q} \partial_4 \Delta PG_{t-i} + \sum_{i=1}^{q} \partial_5 \Delta DCPS_{t-i} + \sum_{i=1}^{q} \partial_6 \Delta EGS_{t-i} + \sum_{i=1}^{q} \partial_7 \Delta IGS_{t-i} + \mu_t \quad [2]$$

The Δ signifies the difference operator, the model intercept and coefficients are represented by $\beta's$. The p & q are the lag orders of ARDL. The coefficients of short run are signified by ∂_i.

The Eq [3] reflects the long run coefficients estimation

$$\Delta IN_i = \beta_0 + \beta_1 IN_{t-i} + \beta_2 LFP_{t-i} + \beta_3 INF_{t-i} + \beta_4 PG_{t-i} + \beta_5 DCPS_{t-i} + + \beta_6 EGS_{t-i} + \beta_7 IGS_{t-i} + \mu_t \quad [3]$$

The short run coefficients estimates and the error correction form is shown in Eq. [4].

$$\Delta IN_i = \sum_{i=1}^{p} \partial_1 \Delta IN_{t-i} + \sum_{i=1}^{q} \partial_2 \Delta LFP_{t-i} + \sum_{i=1}^{q} \partial_3 \Delta INF_{t-i} + \sum_{i=1}^{q} \partial_4 \Delta PG_{t-i} + \sum_{i=1}^{q} \partial_5 \Delta DCPS_{t-i} + \sum_{i=1}^{q} \partial_6 \Delta EGS_{t-i} + \sum_{i=1}^{q} \partial_7 \Delta IGS_{t-i} + \partial ECM_{t-1} + \mu_t \quad [4]$$

The ∂ is the residuals' speed of adjustment related to ECM. The long run relationships do exist if the coefficient of ECM is significant and bears a negative sign.

Diagnostics

The diagnostics are executed to trace the stability and acceptability of the estimates. The diagnostics are accomplished through Breusch-Godfrey serial correlation (LM Test). In this test, if the value of chi-square is greater than 0.05, it settles that there's not any serial correlation and else true.

Likewise, for the heteroskedasticity examination, the probability of chi-square value must be higher than 0.05 and if vice versa, the series is said to be homoscedastic (Wang et al., 2021). Also, Cumulative Sum of Recursive Residuals (CUSUM) and of the CUSUM squared are sightseen for the stability of the results. If the diagram series shows the trend line to remain within the red boundaries at 5 percent significance level, the parameters are according to the requirement and stable in structure and else true (Zaman et al., 2022,

Mehmood et al., 2024). The Ramsay RESET Test and Jarque Bera Test of correctly specified model and the issue of abnormality of residuals are also check for proving reliability of regression results.

Interpretation of Results

This section devotes the presentation of the results. The descriptive statistics are given in Table 4.

Table 3

Descriptive Statistics

Variables	IN	LFP	INF	PG	DCB	EGS	IGS
Mean	55.6	49.14	8.46	2.59	20.7	14007	248252
Maximum	17.2	53.15	20.28	4.42	29.7	702613	1499186
Minimum	-5.8	32.2	2.52	1.2	13.8	2948.5	5457.8
Std. Dev.	3.1	3.72	4.08	0.83	4.55	165574	335452.9
Skewness	-0.28	-3.11	0.84	0.18	-0.09	1.41	1.78
Kurtosis	4.9	13.46	3.93	2.19	1.74	4.60	6.11
Jarque-Bera	6.4	2.66	6.67	1.4	2.89	18.97	40.24
Probability	0.04	0.00	0.04	0.49	0.23	0.000076	0.0000

The descriptive statistics show a no less dispersion with almost all the series except IGS. Moreover, IN is negatively skewed where else rest of the variables are positively skewed series. Except PG and DCB, the variables are leptokurtic in distribution. Concluding Jarque-Bera, PG and DCB are normally distributed series. The Table 5 is allocated to know the status of unit root.

Table 5

Unit Root Test Results

Variables	Test Statistics (At 5% level of significance)	Augmented Dickey Fuller test statistic (At Level)	Augmented Dickey Fuller test statistic (At 1st Difference)
IN	-2.935001	0.0001	0.0000
LFP	-2.933158	0.0001	0.0007
INF	-2.935001	0.0000	0.0001
PG	-2.936942	0.0000	0.1042
DCB	-3.596616	0.0442	0.0000
EGS	-3.544284	0.0342	0.0063
IGS	-3.004861	0.0542	0.0082

The observations recorded by the mean of Augmented Dickey-Fuller unit root test show that all the series integrated of either I(0) or I(1). Hence, ARDL is an appropriate technique for the computation of regression estimates. The Bound Test is concluded to know the long run cointegration. The results are given in Table 6.

Table 6

Bound Test

Test Statistic			F-statistic	
Value			5.56189	
k			6	
Significance	10%	5%	2.5%	1%
I (0) Bound	1.99	2.27	2.55	2.88
I (1) Bound	2.94	3.28	3.61	3.99

The bound test results illustration confirm that the computed F-statistic is significant at 5 percent level of significance. Also, it is higher than the table value at I(1). Hence, the long run cointegration is accorded on the prescribed model given in Eq. [2].

Moving on to the estimation of Eq [3], the results are published in Table 7.

Table 7

Long Run ARDL Results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LFP	0.488252	0.247131	1.975679	0.0738
INFC	-0.498106	0.171069	-2.911730	0.0141
PG	0.887537	2.684049	0.330671	0.7471
DCB	0.730332	0.384381	1.900023	0.0839
EGSC	0.018993	0.005963	3.185198	0.0087
IGSC	0.007211	0.002518	2.863876	0.0154
C	10.661259	13.484294	0.790643	0.4459

The results conclude that LFP is positive in its direction of effect on IN. One unit increase in LFP tends to foster industrial value addition by 0.48 percent. As indicated by Aiyar and Feyrer (2002), LFP enhances growth and productivity, especially in the developing economies who are mostly the labor intensive in their productive capabilities. Inflation is posting a negative effect on IN. Rising prices are fatal for the consumer demand. When the demand is depressed, producers do not initiate their production. The findings of this study also show a significant positive effect of DCB. The credit for the private sector instigates the production and helps in updating the technology therefore, in consequence favors the industrial progress.

Besides this, the EGS and IGS are also found positively affecting IN. Therefore, any generous move towards the opening of across the border trade is to improve the industrial footings in long run time span. Nevertheless, the impact of EGS is greater than that of IGS. Hence, the option is to locate the export oriented industrial during the policy making so that the overall industrial growth is recorded together with meet-up of the employment targets, control on inflation, and poverty reduction. The intercept of the model is insignificant thus the omitted variables are not influential to affect the IN.

The Table 8 is given to present the short run ARDL results computed on Eq. [4]. The short run effects of LFP are also significant and positive towards IN. It is interesting to note that inflation is seen favoring the industrialists towards more production in short run. However, consistent increase in inflation causes a permanent damage to the industrial value addition in long run. Therefore, the policy makers need to be cautious in interpreting the positive spell outs of inflation in short term because the long run effects are otherwise once the inflation and industrial value added is taken into account. Akin to long run, DCB is linear in relationship with IN in short run. Moreover, the IGS is found negatively affecting IN. It is again controversial to long run findings. The conclusion is that short term damage to the industrial value added caused in short run is turned into a helping hand towards industrialization in the long run. The coefficient of ECM is negative in sign and significant but is lesser than the prescribed range thus show an oscillatory convergence (Mehmood et al., 2024).

Table 8

Short Run ARDL Results

Variable	Coefficient	Std. Error	t-statistic	Prob.
D(LFP)	-0.021216	0.086690	-0.244740	0.8112
D(LFP(-1))	0.728637	0.114491	6.364121	0.0001
D(LFP(-2))	0.508949	0.126077	4.036823	0.0020
D(INF)	0.608979	0.158208	3.849226	0.0027
D(INF(-1))	0.918291	0.226376	4.056494	0.0019
D(INF(-2))	0.416222	0.146741	2.836444	0.0162
D(PG)	3.554803	2.684719	1.324088	0.2123
D(PG(-1))	-5.606696	2.064932	-2.715196	0.0201
D(DCB)	1.177628	0.233654	5.040049	0.0004
D(DCB(-1))	0.535052	0.238094	2.247227	0.0461
D(DCB(-2))	0.063767	0.206576	0.308687	0.7633
D(DCB(-3))	0.477238	0.204167	2.337491	0.0393

Variable	Coefficient	Std. Error	t-statistic	Prob.
D(EGS)	0.018015	0.003658	4.924602	0.0005
D(EGS(-1))	0.001412	0.003297	0.428414	0.6766
D(EGS(-2))	-0.004178	0.003262	-1.280657	0.2267
D(EGS(-3))	-0.011816	0.003419	-3.456191	0.0054
D(IGS)	-0.004685	0.001793	-2.613576	0.0241
D(IGS(-1))	-0.008414	0.001716	-4.903270	0.0005
D(IGS(-2))	-0.008966	0.002394	-3.744584	0.0032
D(IGS(-3))	-0.009891	0.003210	-3.081216	0.0104
ECM(-1)	-1.604435	0.187923	-8.537720	0.0000

The regression estimates are validated by running the diagnostic analyses. The results are published and summarized in Table 9.

Table 9

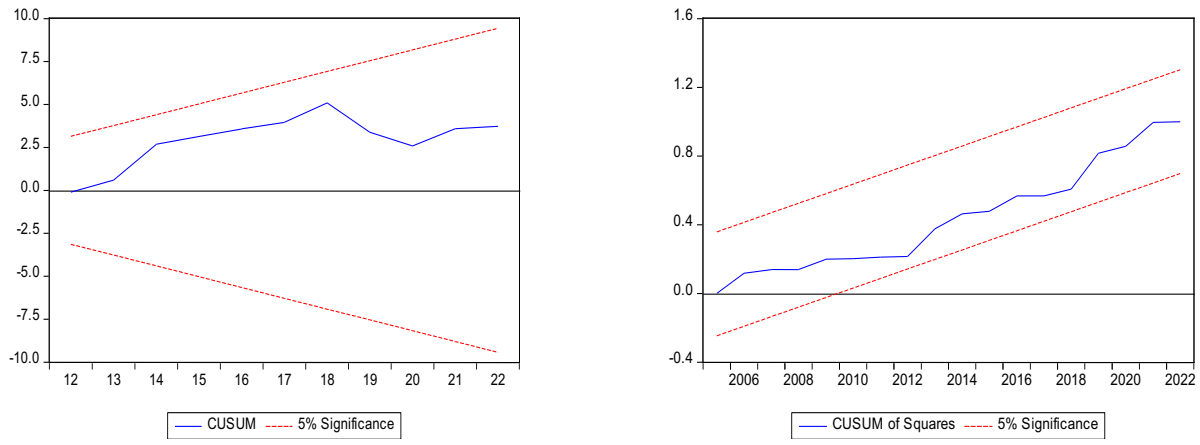
Diagnostic Analyses

Test	Statistics (Prob. Chi-Square)	Conclusion
Breusch-Godfrey Serial Correlation LM Test	0.49	No serial correlation
Heteroskedasticity Test: Breusch-Pagan-Godfrey	0.86	No issue of heteroskedasticity
Ramsey RESET Test	0.54	Model is correctly specified
Jarque-Bera	0.27	Residuals are normally distributed

The findings of CUSUM and CUSUM squared are given in Figure 1. The findings concluded the stability of the regression estimation and no presence of structural instability.

Figure 1

CUSUM-CUSUM Squared



Conclusions and Policy Suggestions

The conclusion of the research underscored the crucial role of LFP and DCB towards the industrial value added of Pakistan. The approach to concluded the regression estimates was ARDL. The length of the time series secondary data was of 43 years starting from 1980. The key findings have affirmed that LFP and DCB are important ingredients to favor the industrial progress in both time horizons. However, the DCB is more impactful as compared to LFP. Hence it is recommended as a policy norm that the government ought to attempt in further improving the credit availability towards the industrial sector together with the facilitation and motivation of the labor force to have a concrete and potential efforts towards industry so that the target of economic growth, poverty alleviation, and employment creation are achieved.

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