



Examining the Inter-Sectoral Relationship, Productivity and Inclusive Growth of Pakistani and Indonesian Economies

Nadia Hassan¹, Atiq ur Rehman²

¹Department of Economics, The Islamia University of Bahawalpur, Bahawalpur, Pakistan,
Email: nadia.hassan@iub.edu.pk

²Kashmir institute of Economics, University of Azad Jammu and Kashmir, AJ&K, Pakistan.
Email: a.rehman@ajku.edu.pk

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ABSTRACT

Inclusive growth is progressing the diverse patterns, backgrounds, and sectors of an economy. As an equitable economy has more potential for prosperity so reducing the inequalities and enhancing the productivity of workers in all the sectors of the economy is a core concern for emerging policies. Sectoral interlinkages and patterns of production are the basis for economic growth and essential for welfare outcomes. Therefore, the study analyzes the sectoral integration of Pakistan and Indonesian economies using the dataset from 1980 to 2019. For this purpose, the productive efficiency of workers is focused on three major sectors of economies i.e., services, manufacturing, and agriculture sector. In this study, we have used the VAR model to assess the integration and causal relationship among sectors and found that the per capita value addition of labor is relatively higher in the manufacturing sector of Pakistan and Indonesia. More than 36 percent of employed labor is in the agriculture sector of Pakistan but it has a slow growth rate of only 0.97 percent in 2019. Indonesia has the second-highest employment in the agriculture sector (i.e., 3.6 percent) but the lowest per capita value-added. This indicates slow development and high deprivations in the agriculture sector of both economies particularly in terms of opportunities. The services sector of Pakistan is categorized as a major sector in terms of employment with the highest growth rate that is approximately 3.7 percent whereas the Indonesian services sector has also employed a large share of total employment i.e., 48.9 percent in 2019. But it is found that the value-added production of Indonesia has been lower in services than in the industrial sector. We found a positive association of the services sector with agriculture is found in both economies but there is a negative relationship between agriculture and industry for Pakistan. Therefore, it is suggested to focus the skill development programs aligned with sectoral requirements and provide incentives for efficient allocation of employment across sectors to get the benefits of growth in a broad base.



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Corresponding Author's Email: nadia.hassan@iub.edu.pk

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1. Introduction

Inclusive growth refers to involving every member of society in the process of economic development and share its outcomes. It is a broad-based approach with long-run prospects that emphasize the equitable distribution of opportunities across all sectors (I. Ali & Son, 2007; Berg & Ostry, 2011; Yusuf & Sumner, 2017).

Productive efficiency of human resources is inevitable for effective transformation of structural composition. In this context, value-added production and competitive participation of labor in agriculture, industry, and services sectors is one of the key channels to ensure pro-poor development (McKinley, 2010). As income redistribution by value-added employment across sectors is rather a sustainable approach to reduce poverty and inequality. Since the equitable distribution of resources and opportunities requires involving the workers excluded from the economic activity or those engaged in low productive processes (Ianchovichina & Lundstrom, 2009; Kraay, 2004). So, the inclusion of human resources as productive agents is the preferred approach to direct transfer programs for the deprived groups of the economy. However, it is important to ensure that productivity and sectoral relationships are a means but not the end to avail welfare outcomes and improved living conditions of all (Anand et al., 2013).

Structure, composition and economic integration of major sectors of a country is vital to define and transmit the potential benefits of growth to everyone (Habito, 2009). Because there are significant forward and backward linkages across sectors for input requirement and output absorption (Dorosh & Thurlow, 2018) the imbalance in employment opportunities and production efficiencies create barriers to achieve the targets of development. In process of growth nearly, every economy must go through a transformation phase in its structure (Imbs & Wacziarg, 2003) that may shift its base, e.g., rural to urban or traditional agrarian to advance the technology-based industrial economy. In this process, efficient employment of labor across sectors is one of the major policy challenges to ensure pro-poor growth in the long run. Sometimes less productive workers of the dominant sector are required to relocate for contributing efficiently to other economic activities to meet the goals of equitable income distribution and poverty reduction (Cook, 2006) in the economy.

Pakistan, Indonesia and many other Asian economies have gone through the growth process along with the structural decomposition of major sectors over decades (McKinley, 2010). There has been a continuous transformation of employment patterns and productivity across sectors. As with diversification in the production structure, the policy focus has kept switching between goals of productive growth of agriculture and targets of high industrial output to exploit the benefits of growth (Cook, 2006; Habito, 2009). Despite having low levels of Gross Domestic Product (GDP) in the late 1990s, employment in the Indonesian economy has substantially shifted from the agriculture sector to services. The share of agriculture output in total is lowest in all sectors after 1970, it has been around 12 percent during 2019. Whereas, industrial and services sectors have approximately 45 and 40 percent share in production. Growth in agriculture output is reported to be lowest i.e., 0.57 percent annually in 2019 (World Development Indicators, , 2019).

In Pakistan, the major share of sectoral output has shifted from agriculture to services. This transformation has also changed the structure of employment across sectors such that there is a considerable increase in the services sector's employment. However, the agriculture sector is still one of the highest employing sectors of the economy with more than 36 percent of the total employed labor force, but its growth rate is just 0.57 percent

which is the lowest among other sectors (Economic Survey of Pakistan, 2020). A high employment rate with slow growth shows the poverty and loss of welfare to the labor and associated households of this sector. Similarly, the Indonesian economy is also facing challenges of efficient employment and growth across sectors. Both countries have experienced high unemployment, lower per capita productivity, and inequality. In addition to this, there is also a high rate of income poverty and multidimensional poverty in both countries (Oxford Poverty and Human Development Initiative, 2020; Oxford Poverty and Human Development Initiative, 2020).

Inclusive growth focuses to equalize the opportunities and progress in productive employment (Ianchovichina & Lundstrom, 2009) which refers to the efficient utilization of potential outcomes contributed by labor to each sector (Berg & Ostry, 2011). The conventional process for rapid macro-economic growth cannot bring many benefits for the poor because it does not consider the factors of equity (I. Ali, 2007; Drèze & Sen, 2013). This study is aimed to investigate and highlight the need for inclusion of this factor by analyzing the sectoral integration among the major sectors of two developing economies i.e., Pakistan and Indonesia. It is also focused to examine the underutilization of labor resources by analyzing labor as an efficient factor of production in each sector. In this context, sectoral production growth and per worker value-added output are evaluated for both economies.

The rest of the study is arranged as follows. Section 2 presents a brief overview of existing literature. Section 3 explains the data and methodology, Section 4 presents the results of the study and Section 5 concludes the study.

2. Literature Review

After the 1990s, the economic growth in Asian economies has been quite high but there is an increase in the levels of inequality coupled with sluggish poverty reduction in many of these economies (Cain et al., 2011) . Besides other reasons, it argued to acknowledge that growth and development are processes that essentially affect the structural decomposition and patterns of the economy (Aghion and Howitt, 2009) and this the effect is on the aggregate level. It is referred to as 'structural transformation' that brings greater shifts in patterns of employment and output in a country. In developing countries like Pakistan and Indonesia with existing high unemployment such inequalities create greater challenges for appropriate labor adjustment, economic well-being, and inclusive opportunities (Adams, 2004; Imbs & Wacziarg, 2003).

Sectoral relationships and productivity patterns are supposed to be the basis for economic growth and tools to acquire inclusive outcomes. Studies (Felipe, 2012; Sen, 2016) for Southeast Asian countries have witnessed the combined impact of agriculture, manufacturing, and other sectors on the process of overall economic wellbeing. It is argued that major sectors of the economy have contributed to boost pro-poor development, eradicate poverty and reduce deprivations (Felipe, 2012; Hasan & Quibria, 2004). In a conventional economic setup, the agriculture sector is the basic sector closely associated with rural households and works as a driver to development mechanisms. However, there are many economies in Asia likes Pakistan, Indonesia, Sri Lanka, and Malaysia that have shifted from agriculture to manufacturing and services sectors. But in many of these countries, there is a lack of skilled labor, that results in poor productive performance and inefficient output in each sector (Cook, 2006; Pasha et al., 2003).

It is evident that Pakistan has experienced several episodes of high growth during the 1960s onward, but its benefits are not equitably transferred to the larger proportions of

the population (Ali et al., 1999). Moreover, there have been no sufficient measures to reduce the gap in well-being particularly in the context of sectoral efficiency. So, the rich have become richer, and the poor are poorer. In such a situation, structural transformation increases the risk of persistent deprivations. Since the economies of Pakistan and Indonesia have largely shifted towards the services sector in terms of employment, there are serious concerns regarding this sector than other sectors. According to (ADB, 2011) Pakistan is considered one of the economies that make very slow progress in transferring the inclusive benefits equitably across the population. Indonesian progress for productive employment also does not seem promising to provide inclusive opportunities. It indicates that labor absorption patterns are potentially not efficient in the major sectors of these economies (Ali & Zhuang, 1997; Felipe & Briones, 2013; McKinley, 2010).

It is established that sectoral decomposition-led growth may not necessarily be leading to an efficient allocation of labor resources (Ali, 2007) unless there is no regulatory framework. It happens because there is not a simultaneous process of growth in all sectors of the economy. Instead, growth may further increase inequalities and welfare exclusion across sectors and households. Therefore, employment and efficient productivity are the major challenges to boost the development practices on a broad basis. For this objective, one way is to adjust the employment in sectors with a higher share of employment and low production in a way that improves the efficiency of workers and bring benefits to subsequent households as dominant sectors cover larger proportions of the population (Ali & Zhuang, 1997).

Asian Development Bank (ADB) has conducted several studies regarding productive employment and inclusive growth (Ali, 2007; Felipe & Briones, 2013; McKinley, 2010) but empirical evaluation across sectors is not conducted for Pakistan and Indonesian economies. In general, inclusive growth is significantly determined by the specific characteristics of a country (Ali & Son, 2007; Anand et al., 2013). Thus, findings from other Asian economies (Habito, 2009; Ianchovichina & Lundstrom, 2009) cannot be generalized for these countries. It requires an empirical analysis and insights for the sectoral potential in the growth prospect of Pakistan and the Indonesian economy. These two countries are developing countries and have similar economic characteristics so can serve as a better case for detailed analysis. So, the case of these two economies can also support make a comparison with other developing countries regarding sectoral integration and benefits of inclusive growth.

3. Data and Methodology

To examine the inter-sectoral relationship, productivity, and inclusive growth, we have taken data of value-added production for three major sectors of economies i.e., agriculture, industrial, and services for the period of 1980 to 2013. Employment in agriculture, industrial, and services is also included for estimating per-worker productivity. The total labor force and the unemployment rate are used to find the percentage share of employment in each sector to total employment. The data is obtained from the World Development Indicators (2019). We have employed the smooth SP filter method for replacing the missing values. The productivity in agriculture (Y_{jt}^{agr}), industry (Y_{jt}^{ind}) and services (Y_{jt}^{ser}) is estimated by dividing the value added per worker to total employment in the respective sector. where, Y_{jt} represents for j^{th} country at t time in each sector and we take natural logarithm of all series.

Productive employment in major sectors is used as an indicator along with other dimensions of the inclusive growth index (McKinley, 2010). Many studies (Cook, 2006;

Ianchovichina & Lundstrom, 2009; Lee et al., 2013) have graphically analyzed sectoral relationships and productive employment. Figure 1 and figure 2 represent the state of labor productivity in three major sectors of Pakistan and Indonesian economy respectively.

In Pakistan there has been a rise in productivity of workers over time, it has been highest during the late 1980s there is a fall in productivity after 1990s. However, in this sector overall labor efficiency has been higher than in other sectors. The productive employment in the industrial sector has also increased over time with some fluctuations. Before 2000 the industrial production per worker has been higher than services sector, however agriculture sector shows lowest productive employment which is increasing over time with a slow pace.

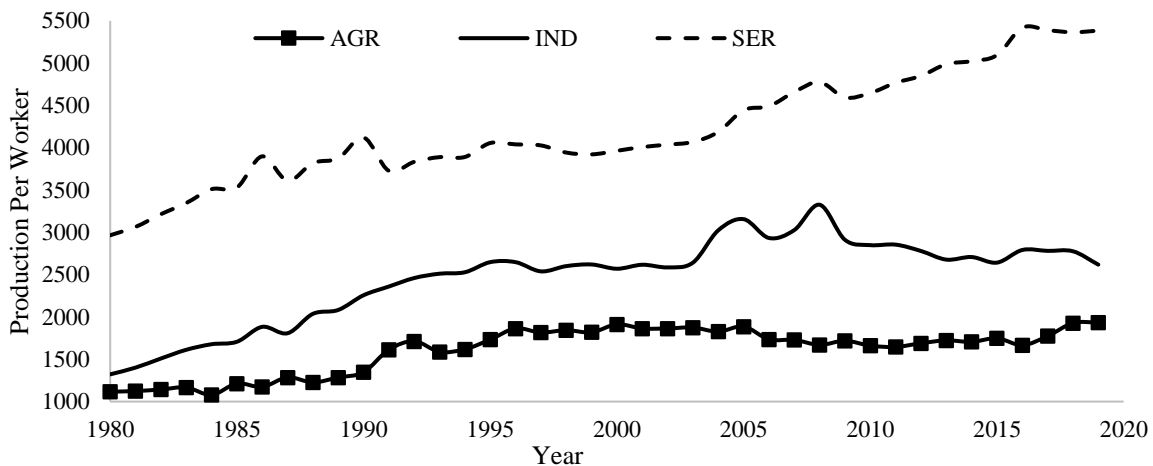


Figure 1: Per worker Productivity - Pakistan (1980-2019)

Source: Authors' own calculations based on WDI 2019

Figure 2 represents the productive employment in Indonesia which is highest in industrial sector as it has increased over time with some ups and downs during 1985 to 2000. Services sector is also contributing to improve productivity however, it is far below than industrial sector. Agriculture sector's output per worker is lowest in both the economies. The output in this sector is stagnant and shows marginal improvement over time.

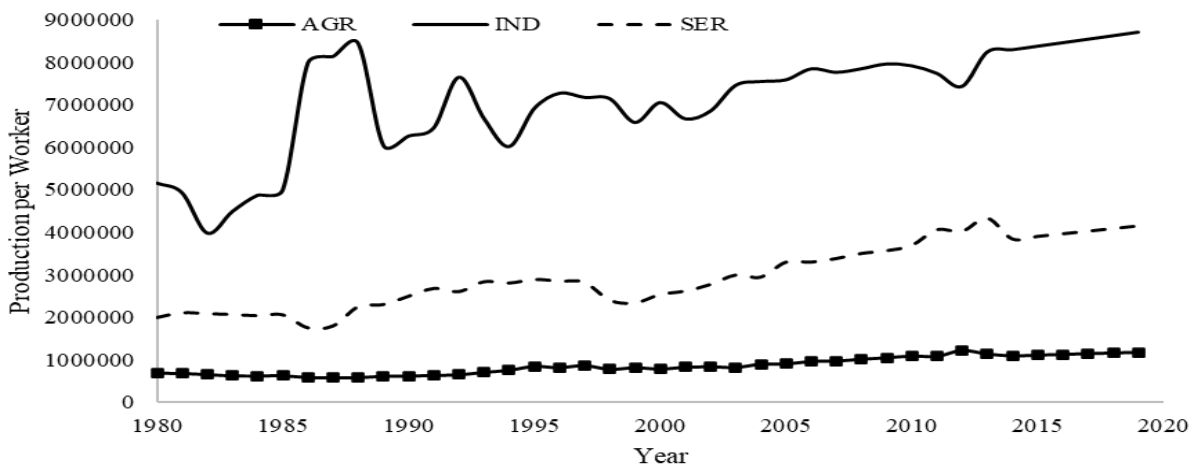


Figure 2: Productivity - Indonesia (1980-2019)

Source: Authors' own calculations based on WDI 2019

To examine the relationship between sectors, first we test the stationarity of the data. Therefore, we employ Augmented-Dickey-Fuller (ADF) test to inquire the existence of unit root in the series (Dickey & Fuller, 1979).

$$\Delta Y_t = \beta Y_{t-1} - \sum_{i=1}^p \delta_i \Delta Y_{t-i} + \varepsilon_t \tag{1}$$

where, ΔY_t is the first difference of series. If $H_0: \beta = 0$ is not rejected which refers that series has a unit root $Y_t \sim I(1)$. Hypothesis of unit root is tested using t -ADF value.

This study examines the relationship across sectors; however, there is no predefined division of endogenous and exogenous variables. As there is no established economic theory that defines the nature and pattern of productivity association among sectors. Thus, it is appropriate to adopt unrestricted Vector Autoregression (VAR) model (Sims, 1980) to analyze the productivity, composition, and relationship of economic sectors. The VAR of order k is expressed as:

$$Z_t = \sum_{i=1}^k A_i Z_{t-i} + \varepsilon_t \tag{2}$$

Here, $Z_t = [Y_{jt}^a \ Y_{jt}^{ind} \ Y_{jt}^{ser}]$ is vector of contemporaneous values of all n endogenous variables. $\sum_{i=1}^k A_i Z_{t-i}$ is a vector of lagged endogenous variables. A is vector of coefficients of parameters in Unrestricted Reduced Form (URF) equations ε_t is column vector of errors? We assume that ε_t has no autocorrelation and order of VAR is defined by selecting appropriate lag length using the information criteria.

To determine the long-run relationship of sectoral productivity, VAR based cointegration analysis is employed using Johansen (1988) cointegration technique.

$$\Delta Z_t = \Pi \cdot Z_{t-k} + \sum_{i=1}^{k-1} \Gamma_i \Delta Z_{t-i} + \varepsilon_t, \text{ for } k \geq 2 \tag{3}$$

Here, $\Pi = -(I - A_1 - A_2 - \dots - A_k)$, I is identity matrix. $\Gamma_i = -I + A_1 + A_2 + \dots + A_i$, $i = 1, \dots, k - 1$. Since Π is a square matrix of order $k \times k$ for cointegration of series it is required that rank of Π . Rank of matrix Π is used for checking the cointegration relationship of series. Cointegration exists if $0 < r(\Pi) < m$. Here, m is the number of endogenous variables in the VAR (Charemza & Deadman, p. 150-199, 1997).

The model is simplified by taking lag structure analysis which indicates the significance of each lag of series. F test is used to check $H_0: (\alpha_{ji}, \beta_{ji}, \gamma_{ji}) = 0$ against $H_1: (\alpha_{ji}, \beta_{ji}, \gamma_{ji}) \neq 0$. Here, α_{ji}, β_{ji} and γ_{ji} are coefficients of Y_{jt}^a, Y_{jt}^{ind} and Y_{jt}^{ser} respectively for j^{th} country $i = 1, 2, \dots, k$ order of VAR. Excluding all insignificant lags can help to simplify the URF equations of model. Static long run solution using Wald test is applied to check the sign of long run relationship of variables.

Given the URF matrix in equation (4), impulse responses are used to see the dynamic impact of one-unit exogenous shock in one variable at time t on other variables at time $t, t + 1, t + 2$ (Charemza & Deadman, 1997).

$$\begin{bmatrix} Y_{jt}^a \\ Y_{jt}^{ind} \\ Y_{jt}^{ser} \end{bmatrix} = \begin{bmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{bmatrix} \begin{bmatrix} Y_{jt-1}^a \\ Y_{jt-1}^{ind} \\ Y_{jt-1}^{ser} \end{bmatrix} + \begin{bmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \\ \varepsilon_{3t} \end{bmatrix} \tag{4}$$

The forecast performance of estimated model is estimated by using two methods. Firstly, one-step-ahead conditional forecast and secondly, dynamic or multi-step forecast of

VAR. This model is used to test the causality in sectoral productivity of both economies (Charemza & Deadman, 1997).

To inquire that if Y_{jt}^{ind} and Y_{jt}^{ser} granger cause Y_{jt}^a hypotheses are tested for equation (5) as: $H_0: (\beta_1^a, \beta_2^a, \dots, \beta_k^a) = 0$ against $H_1: (\beta_1^a, \beta_2^a, \dots, \beta_k^a) \neq 0$ and $H_0: (\gamma_1^a, \gamma_2^a, \dots, \gamma_k^a) = 0$ against $H_1: (\gamma_1^a, \gamma_2^a, \dots, \gamma_k^a) \neq 0$. To investigate causality links, similar hypotheses are tested on the lagged coefficients of sectors' productivity in equation (6) and (7) (Granger, 1969).

$$Y_{jt}^a = \alpha_0^a + \sum_{i=1}^k \alpha_i^a Y_{jt-i}^a + \sum_{i=1}^k \beta_i^a Y_{jt-i}^{ind} + \sum_{i=1}^k \gamma_i^a Y_{jt-i}^{ser} \quad (5)$$

$$Y_{jt}^{ind} = \alpha_0^{ind} + \sum_{i=1}^k \alpha_i^{ind} Y_{jt-i}^{ind} + \sum_{i=1}^k \beta_i^{ind} Y_{jt-i}^a + \sum_{i=1}^k \gamma_i^{ind} Y_{jt-i}^{ser} \quad (6)$$

$$Y_{jt}^{ser} = \alpha_0^{ser} + \sum_{i=1}^k \alpha_i^{ser} Y_{jt-i}^{ser} + \sum_{i=1}^k \beta_i^{ser} Y_{jt-i}^{ind} + \sum_{i=1}^k \gamma_i^{ser} Y_{jt-i}^a \quad (7)$$

4. RESULTS AND DISCUSSION

First, we conduct unit root test for level series of both the countries. The results presented in Table 1 show that all three series are integrated of order one for Pakistan. We find the evidence of unit root of Indonesian agriculture and services productivity, whereas the series of industrial productivity is stationary at 10% level.

Table 1
Augmented Dickey-Fuller test for Unit root (Level Series)

Variables (Pakistan)	t-statistic	Variables (Indonesia)	t-statistic
Y_{pkt}^a	-1.737	Y_{int}^a	-0.208
Y_{pkt}^{ind}	-3.153	Y_{int}^{ind}	-2.934*
Y_{pkt}^{ser}	-1.316	Y_{int}^{ser}	-0.101

ADF critical Value (**1%=-3.64, **5%=-2.95, *10%=-2.61)

Second, VAR model for Pakistan is estimated by using URF equations of level series (Table 2). We take four lags for each endogenous variable are included based on Akaike Information Criteria (AIC).¹

There is no serial correlation in residuals of estimated Var model, and it also satisfies the stability condition². Table 3 exhibits the result of cointegration which suggest that there exist one cointegrating vector. Because $H_0: r(\Pi) = 0$ is rejected at 1 percent level of significance illustrating the existence of long-run relationship in sectoral productivity of Pakistan.

Table 2
URF Equations (Level Series of Pakistan)

	URF Equation for Y_{pkt}^a		URF Equation for Y_{pkt}^{ind}		URF Equation for Y_{pkt}^{ser}	
	Co-efficient	t- prob	Co-efficient	t- prob	Co-efficient	t- prob
Y_{pkt-1}^a	-0.493	0.2653	-0.653	0.205	-0.919	0.104
Y_{pkt-2}^a	-0.342	0.4818	-0.087	0.876	-0.235	0.698
Y_{pkt-3}^a	0.011	0.9817	0.400	0.482	0.540	0.381
Y_{pkt-4}^a	-2.166	0.0004	-2.989	0.000	-2.548	0.001
Y_{pkt-1}^{ind}	-0.105	0.8711	-0.250	0.738	-0.935	0.255
Y_{pkt-2}^{ind}	1.029	0.1816	1.556	0.087	1.539	0.114

¹ See table 1 in Appendix A.

² See table 2a and 2b in Appendix A.

$y_{pkt_3}^{ind}$	0.484	0.4705	0.867	0.269	0.463	0.580
$y_{pkt_4}^{ind}$	-0.969	0.0634	-1.204	0.048	-0.983	0.126
$y_{pkt_1}^{ser}$		0.3247	1.183	0.144	2.046	0.025
$y_{pkt_2}^{ser}$	-0.495	0.5858	-1.242	0.245	-0.993	0.385
$y_{pkt_3}^{ser}$	-0.656	0.3972	-1.507	0.103	-1.255	0.202
$y_{pkt_4}^{ser}$	2.557	0.0014	3.529	0.000	2.936	0.003
Constant	11.609	0.0001	11.494	0.001	11.131	0.002
σ	0.129		σ	0.149	σ	0.161
RSS	0.282		RSS	0.377	RSS	0.44

Table 3
Johansen Cointegration test (Level series of Pakistan)

	$H_0: r(\Pi) = 0$	Trace test [Prob]
0		47.652 [0.000] ***
1		14.076 [0.080]
2		3.6867 [0.055]

F-test for lag structure analysis of above estimated VAR model shows that first and fourth lag of agriculture, industry and services sector's productivity in Pakistan are significant. $H_0: (\alpha_{pki}, \beta_{pki}, \gamma_{pki}) = 0$ is rejected at 1 percent level of significance.³ The static long-run analysis represents that there is a positive relationship of productivity in the industrial and services sector with the agriculture sector. This supports the classical (Lewis, 1954) and neoclassical (Jorgenson, 1961; Thirlwall, 1986) development frameworks that require to develop the agriculture sector for growth in other sectors particularly in labor abundant countries like Pakistan and Indonesia. Besides this agriculture sector provides inputs for manufacturing and industries and opportunities for activities in the services sector so growth in these sectors increases the demand for agriculture products. The agriculture and industrial sector have a positive association with the services sector's productivity in Pakistan. The services sector is comprised of diverse activities such as manufacturing, transport, and communication, financial, social, personnel services (Ahmed & Ahsan, 2011). Therefore, growth in agriculture and industry increases the services sector's output. The agriculture sector represents a negative association with the industrial sector's value-added per worker.⁴ It is argued that if the labor productivity in the agriculture sector is faster there is the use of new technologies and efficient production mechanisms. It increases the employment opportunities in the industry (Linden & Mahmood, 2007) but if there is a lack of physical capital and efficient technologies this opportunity is missed.

³ See table 1b in Appendix A.

⁴ See table 3 in appendix A.

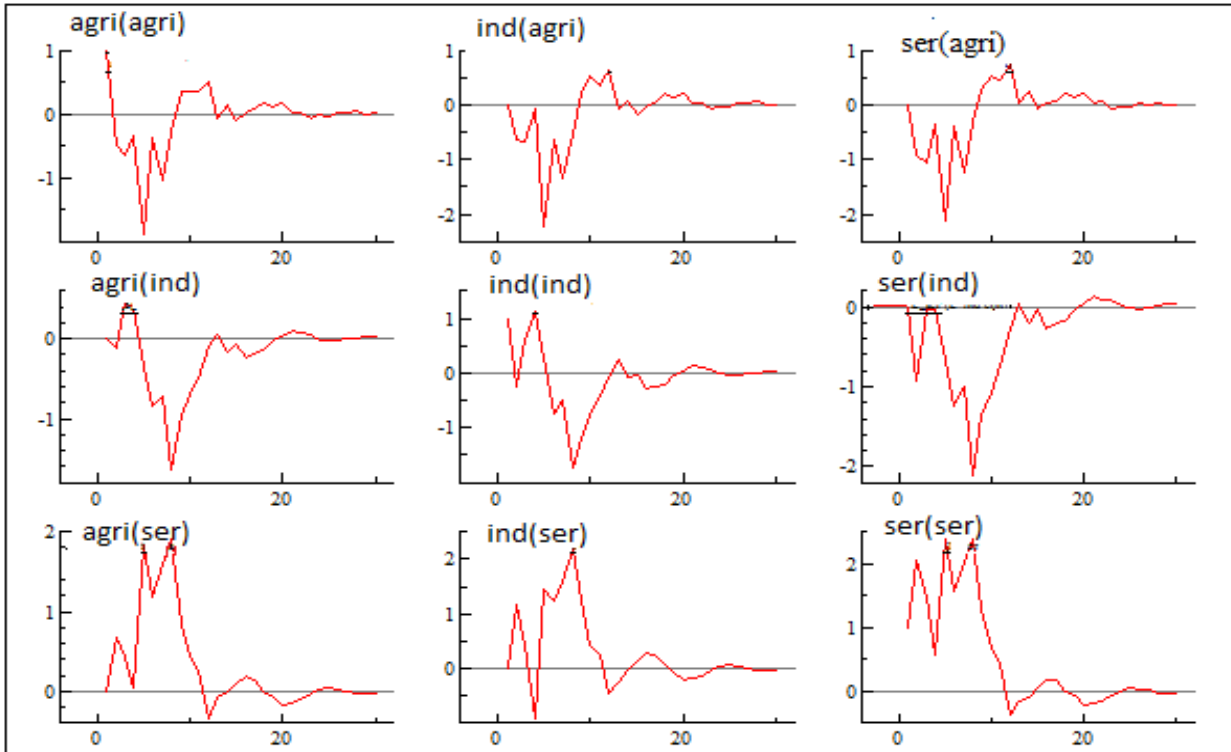


Figure 3: Impulse Responses to Shock in One Sector on Other Sectors (Pakistan)

Figure 3 represents the overtime change in the productivity of one sector following the unit shock in another. The impact of shock in agriculture productivity is one after zero time and there is no instant response on the industrial and services sectors. Similarly, the shock in industrial and services impact comes in other two sectors after time zero. There is a positive impact of shock in services on agriculture and a negative impact on the industrial sector. This is because the growth in the services sector represents the high demand for agricultural output and industry opportunities. However, in most of the developing countries due to lack of sufficient investment industries are not capable to absorb this potential (Linden & Mahmood, 2007). The impact of shock in one sector on its own output is unitary at time zero and over time response to such shock vanishes as it converges to zero. There is no explosive impact of shock in any sector that indicates the stability of the VAR model (Charemza & Deadman, p. 179, 1997).

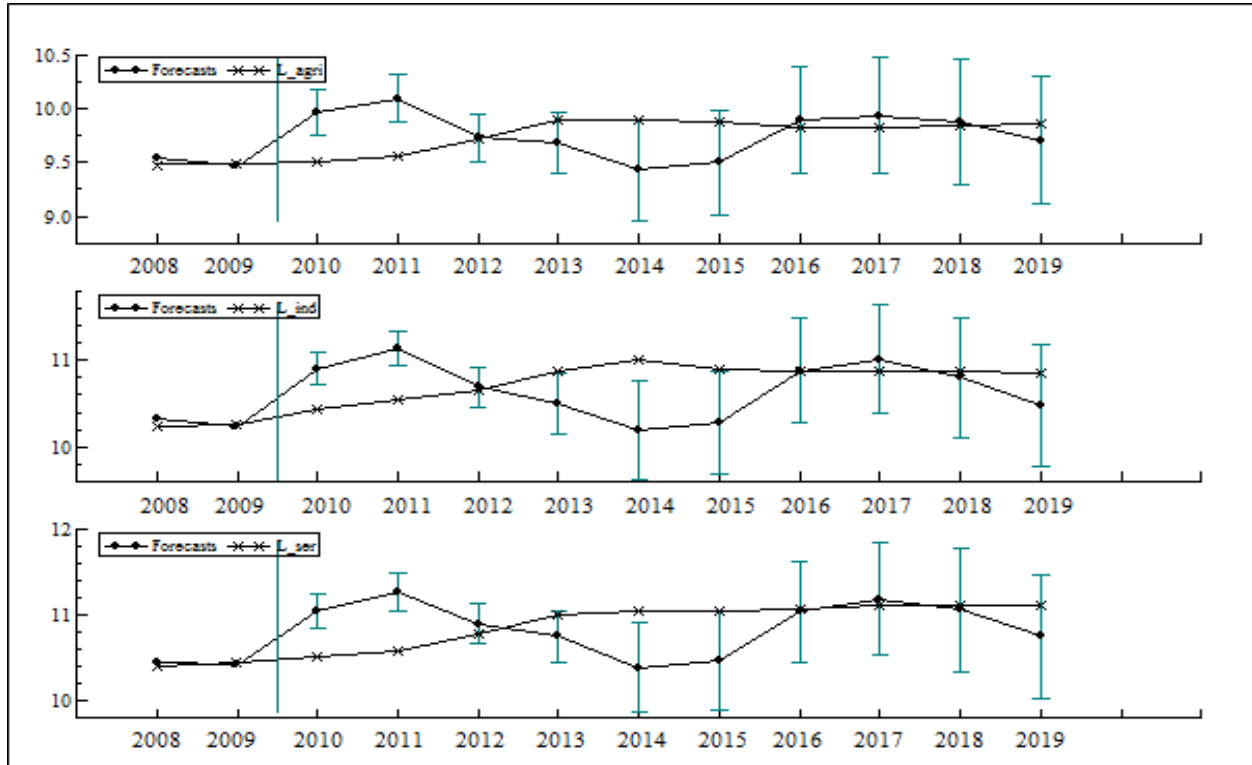


Figure 4: Dynamic Forecasts of VAR Model (Level Series Pakistan)

The forecast performance of the model is within two standard deviations which range in a dynamic approach; only two forecasts are outside the confidence interval for services and the industrial sector. The results of the one-step forecast show a rather weak performance⁵ whereas the forecast performance for the industrial and services sector is quite weak, that is, at a one percent level of significance. However, multi-step the forecast is considered to have more realistic assumptions and its results are acceptable (Charemza & Deadman, p. 183, 1997). The causality link exists from services to the agriculture sector and from agriculture to services sector only.⁶

The VAR model for Indonesia is estimated by URF equations of level series (Table 4). Two lags for each endogenous variable are included based on Akaike Information Criteria (AIC).

This model satisfies the stability test based on estimation of AR roots as no roots lie outside the unit circle⁷. There is no evidence for serial correlation using the LM test⁸.

⁵ See figure 1 in appendix B.

⁶ See table 4 in appendix A.

⁷ See table 7a in appendix A.

⁸ See table 7b in appendix A.

Table 4
URF Equations (Level Series of Indonesia)

	URF Equation for Y_{idt}^a		URF Equation for Y_{idt}^{ind}		URF Equation for Y_{idt}^{ser}	
	Co-efficient	t- prob	Co-efficient	t- prob	Co-efficient	t- prob
$Y_{idt_1}^a$	0.117	0.546	0.844	0.107	0.242	0.482
$Y_{idt_2}^a$	0.551	0.003	-0.623	0.163	-0.173	0.558
$Y_{idt_1}^{ind}$	0.039	0.544	0.699	0.000	0.078	0.500
$Y_{idt_2}^{ind}$	0.049	0.489	-0.157	0.396	0.150	0.230
$Y_{idt_1}^{ser}$	0.344	0.007	-0.343	0.275	0.804	0.001
$Y_{idt_2}^{ser}$	0.026	0.844	0.219	0.529	0.004	0.987
Constant	-2.338	0.004	6.053	0.005	-1.656	0.218
σ	0.040		σ	0.105	σ	0.070
RSS	0.038		RSS	0.263	RSS	0.119

Table 5: Johansen Cointegration test (Level series of Indonesia)

	$H_0: r(\Pi) = 0$	Trace test [Prob]
0		35.901 [0.008] ***
1		12.069 [0.155]
2		0.17671 [0.674]

Cointegration in Indonesian sectors' output per worker refers to the existence of one cointegrating vector as $H_0: r(\Pi) = 0$ is rejected at 1 percent level of significance.

F-test for lag structure analysis of above estimated VAR model shows that first lag of agriculture, industry, and services sector's productivity in Indonesia are significant. $H_0: (\alpha_{id1}, \beta_{id1}, \gamma_{id1}) = 0$ is rejected at 5 percent level of significance.⁹ The static long-run analysis represents that there is a positive relationship of productivity in the industrial and services sector with the agriculture sector. The agriculture and industrial sector have a positive association with the services sector's productivity in Indonesia. The agriculture sector represents a negative association with the industrial sector's value-added per worker.¹⁰

Figure 5 represents the overtime change in productivity of one sector following the unit shock in another. Impact of own shock is one in first period. The shock response is zero in other sectors at first time period whereas other sectors response emerges in subsequent periods with convergence towards. There is no explosive impact thus, VAR model is stable.

For all sectors, the dynamic forecast of the estimated model is significant at 95 percent confidence interval. This performance is consistent with one step forecast of the Indonesian economy¹¹. VAR model performs better for Indonesia than Pakistan's economy to make future predictions. There is a causal relationship between the industry and services sector with the agriculture sector of Indonesia.¹² Historical experience of the Indonesian economy also refers that there has been major shift of employment and share in industry from agriculture sector (Dartanto, Yuan and Sofiyandi, 2017).

⁹ See table 6a in Appendix A.

¹⁰ See table 8 in appendix A.

¹¹ See figure 2 in appendix B.

¹² See table 9 in appendix A.

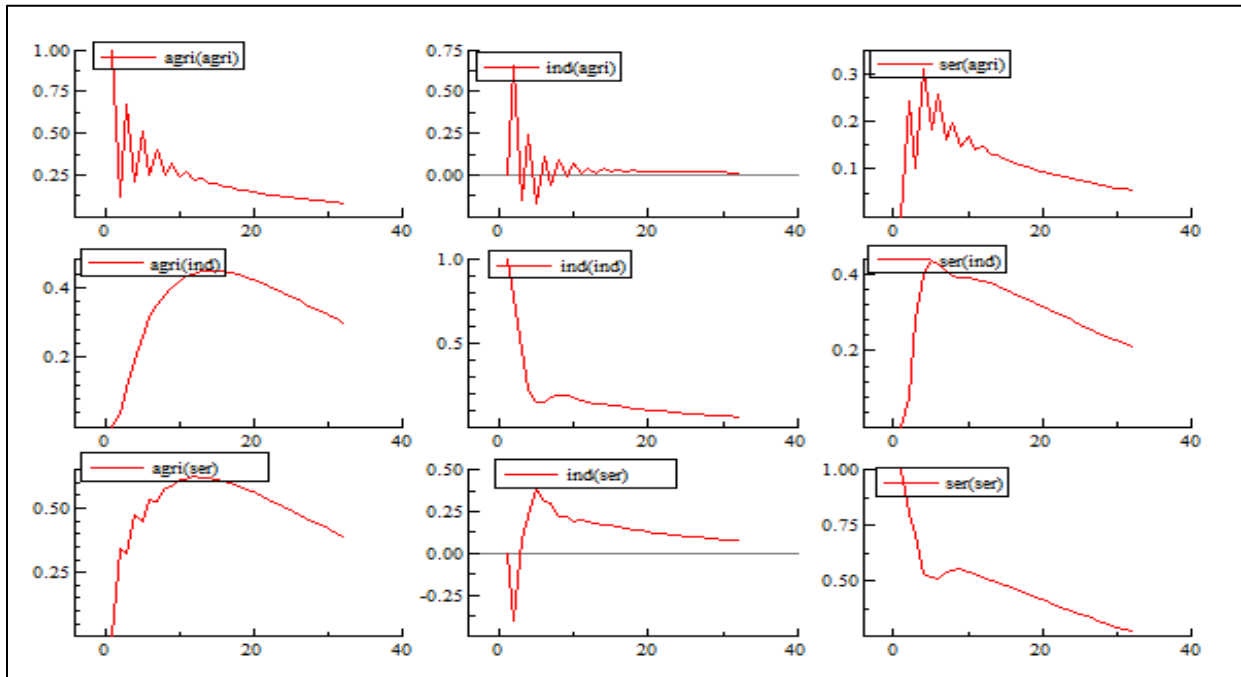


Figure 5: Impulse Responses to Shock in One Sector on Other Sectors (Indonesia)

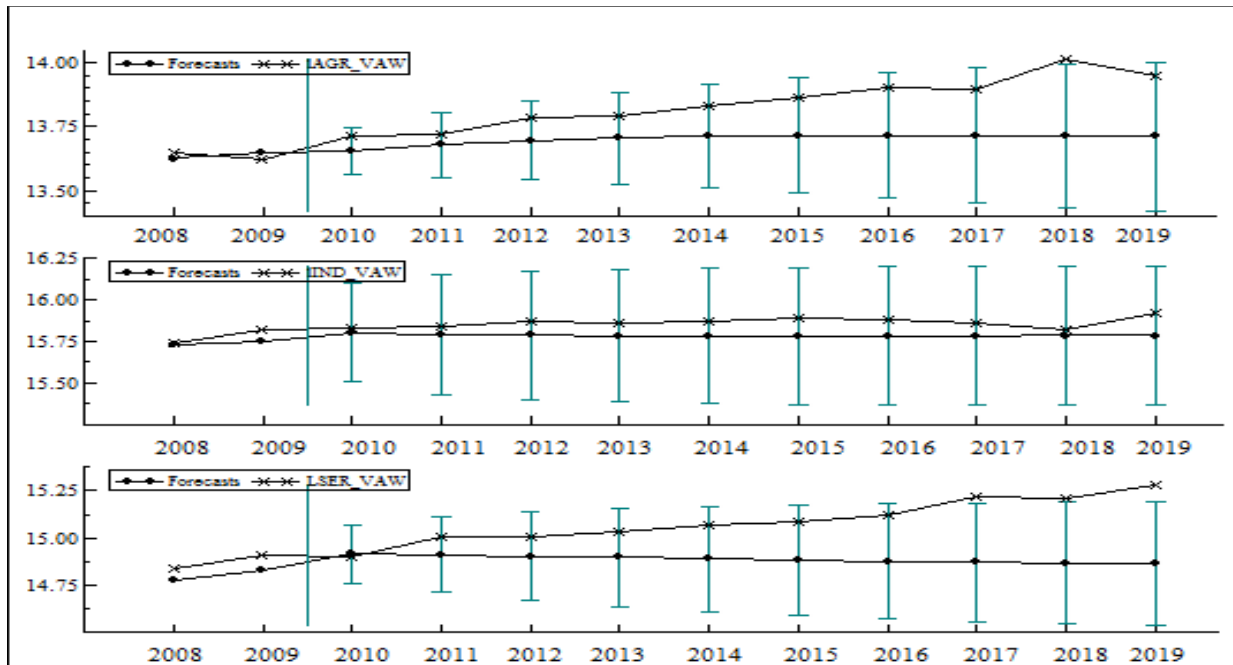


Figure 6: Dynamic Forecasts of VAR Model (Level Series Indonesia)

This study finds many similarities in the across sector productivity of both the economies. We also explore that a long-run relationship exists for per worker value-added production. The services sector has a positive and significant relationship with the

agriculture sector in both economies. However, this sector in Indonesia is significantly and positively associated with the services sector. In addition, industrial productivity is directly associated with productive employment in the services sector. In Pakistan, agriculture productivity has a negative relationship with industrial development. In the last decade, there have been many shocks to both sectors like a flood, political instability, war on terror, and energy crisis (Economic Survey of Pakistan, 2020). It has resulted in a substantial decline in agricultural and industrial production.

5. CONCLUSION AND RECOMMENDATIONS

Inclusive growth requires productive participation of maximum people in any economy. It requires increasing employment opportunities and maximum utilization of labor resources. Recent concerns are largely shifted to ensure the efficient productivity in all sectors of economy. The current study is developed for detailed analysis of per worker value added in three main economic sectors for two Asian countries. Indonesia and Pakistan have gone through major transformation across sectors. This transformation has affected the individuals in long term. It urges to investigate the sectoral relationships to get support for suitable policies' development. VAR modeling approach is used to estimate the links and patterns of productive employment.

Both economies have shifted from agriculture to services sector, and both have issues in efficient utilization of labor resources. Despite of structural transformation of Pakistan economy a large share of employed labor is associated with agriculture and related activities. However, this labor is far less productive than its potential as most of agriculture workers are engaged in inefficient activities. This results in poor yield and loss of welfare to individuals and economy. In contrast sector wise productivity is observed to be relatively higher in Indonesia than Pakistan. But Indonesian economy also faces some major challenges for efficient employment and wellbeing. For instance, services sector is largest employment sector in Indonesia but value addition in sector is not increasing as it should be. Enhancing productive employment in services sector may potentially improve the productivity and efficiency in agriculture sector as significant causal link is observed in these two sectors. There is huge potential for welfare gains from agriculture sector growth and development in both economies. It is witnessed that this sector absorbed a large share of unemployed labor during East Asian crisis in Indonesia.

The results suggest focusing the inclusion of all economic sectors to achieve the benefits of economic growth. This is possible if the value addition and productive employment in each sector particularly the agriculture sector that is basic sector in developing countries, is enhanced. Besides this, efficient development of industrial sector is also vital as it leads a country to technical progress. It is found that both economies have poor labor productivity and slow growth in industrial sector. So, there is need to make appropriate policies that ensure real value addition by industrial workers and create more opportunities to relocate the unproductive workers from other sectors. It also requires improving and facilitate the supply of inputs to industry and introduce the effective skill development programs etc. Such steps are supposed to accomplish the policies of equitable and inclusive growth but, political willingness for growth and development is essential requirement to implement the suggested policies effectively (Felipe, 2012).

This study is done for a brief yet deep insight of sectoral integration and efficient output production in major economic sectors. However, there has been few limitations that can be considered for future research. For instance, it is important to analyze the patterns of gains to workers in each sector to assess the welfare of households, reduce poverty and

inequality. Therefore, inclusion of micro dimension in future research is recommended for effective policy making.

Conflict of Interests/Disclosures

The authors declared no potential conflicts of interest w.r.t the research, authorship and/or publication of this article.

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6. APPENDIX A

Table 1a: VAR Lag Order Selection Criteria (Level Series, Pakistan)

Endogenous variables: Y_{pkt}^a Y_{pkt}^{ind} Y_{pkt}^{ser}						
Included observations: 30						
Lag	LogL	LR	FPE	AIC	SC	HQ
0	57.92	NA	5.16E-06	-3.66	-3.52	-3.62
1	97.38	68.39	0.00	-5.69	-5.131493*	-5.51*
2	102.21	7.41	0.00	-5.41	-4.43	-5.10
3	109.51	9.73	0.00	-5.30	-3.90	-4.85
4	130.35	23.62*	5.46e-07*	-6.09*	-4.27	-5.51
* Indicates lag order selected by the criterion						
LR: sequential modified LR test statistic (each test at 5% level)						
FPE: Final prediction error						
AIC: Akaike information criterion						
SC: Schwarz information criterion						
HQ: Hannan-Quinn information criterion						

Table 1b: Lag Structure Analysis (Level Series, Pakistan)

Tests on the significance of each variable		
Variables	F-test	Value(prob)
α_{pki}	F(12,39)	3.335(0.0021)**
β_{pki}	F(12,39)	4.202(0.0003)**
γ_{pki}	F(12,39)	8.288(0.0000)**
Constant	F(3,15)	7.848(0.0022)**
Tests on the significance of each lag		
Variables	F-test	Value(prob)
$\alpha_{pk4}, \beta_{pk4}, \gamma_{pk4}$	F(9,36)	3.1365(0.0068)**
$\alpha_{pk3}, \beta_{pk3}, \gamma_{pk3}$	F(9,36)	1.3202(0.2610)
$\alpha_{pk2}, \beta_{pk2}, \gamma_{pk2}$	F(9,36)	1.2783(0.2820)
$\alpha_{pk1}, \beta_{pk1}, \gamma_{pk1}$	F(9,36)	3.0823(0.0076)**

Table 2a: AR Root for Stability Check of Var model (Pakistan)

Root	Modulus
0.911	0.911
0.702	0.702
-0.419	0.419
0.310	0.310
-0.045222 - 0.046839i	0.065
-0.045222 + 0.046839i	0.065

No root lies outside the unit circle.
 VAR satisfies the stability condition.

Table 2b: Var Residual Serial Correlation LM Test (Pakistan)

H ₀ : No Serial Correlation		
Lags	LM-Stat	Prob
1	9.450	0.396
2	10.425	0.317
3	11.870	0.220

Table 3: Results of Static Long Run Solution (Level Series, Pakistan)

	Y_{pkt}^a	Y_{pkt}^{ind}	Y_{pkt}^{ser}
Y_{pkt}^a	...	-2.247(0.672)	1.155(0.883)
Y_{pkt}^{ind}	0.181(0.218)	...	0.263(0.621)
Y_{pkt}^{ser}	0.499(0.000)	2.270(0.520)	...

Table 4: Granger Causality Test (Level Series Pakistan)

F-statistic (Probability)	Y_{pkt}^a	Y_{pkt}^{ind}	Y_{pkt}^{ser}
Y_{pkt}^a	...	1.169(0.352)	4.25(0.011)
Y_{pkt}^{ind}	0.58(0.680)	...	1.081(0.39)
Y_{pkt}^{ser}	4.18(0.012)	0.431(0.784)	...

Table 5: VAR Lag Order Selection Criteria (Level Series, Indonesia)

Lag	LogL	LR	FPE	AIC	SC	HQ
0	53.69603	NA	6.84e-06	-3.37974	-3.23962	-3.33491
1	121.0265	116.7062*	1.41e-07	-7.26844	-6.707956*	-7.089133*
2	130.9257	15.17874	1.35e-07*	-7.328380*	-6.34754	-7.0146
3	134.2021	4.368574	2.09e-07	-6.94681	-5.54561	-6.49855
4	146.5314	13.97313	1.86e-07	-7.16876	-5.3472	-6.58603

* indicates lag order selected by the criterion
 LR: sequential modified LR test statistic (each test at 5% level)
 FPE: Final prediction error
 AIC: Akaike information criterion
 SC: Schwarz information criterion
 HQ: Hannan-Quinn information criterion

Table 6a: Lag Structure Analysis (Level Series, Indonesia)

Tests on the significance of each variable		
Variables	F-test	Value(prob)
α_{idt}	F(6,46)	8.2877 [0.0000]**
β_{idt}	F(6,46)	4.9983 [0.0005]**
γ_{idt}	F(6,46)	4.9577 [0.0005]**
Constant	F(3,23)	4.0407 [0.0191]*
Tests on the significance of each lag		
Variables	F-test	Value(prob)
$\alpha_{id2}, \beta_{id2}, \gamma_{id2}$	F(9,56)	2.0241 [0.0533]
$\alpha_{id1}, \beta_{id1}, \gamma_{id1}$	F(9,56)	4.0673 [0.0005]**

Table 6b: URF Equations after Excluding Lag2 (Level Series, Indonesia)

	URF Equation for Y_{idt}^a		URF Equation for Y_{idt}^{ind}		URF Equation for Y_{idt}^{ser}	
	Co-efficient	t- prob	Co-efficient	t- prob	Co-efficient	t- prob
Y_{idt-1}^a	0.715	0.000	0.132	0.589	0.069	0.610
Y_{idt-1}^{ind}	0.076	0.133	0.699	0.000	0.163	0.036
Y_{idt-1}^{ser}	0.270	0.004	-0.001	0.998	0.862	0.000
constant	-1.288	0.072	2.965	0.127	-1.441	0.180
σ	0.0448		σ	0.122	σ	0.0679
RSS	0.0581		RSS	0.433	RSS	0.1336

Table 7a: AR Root for Stability Check of Var model (Indonesia)

Root	Modulus
0.960	0.960
0.878	0.878
-0.731	0.731
0.408581 - 0.419633i	0.585688
0.408581 + 0.419633i	0.585688
-0.224415	0.224415

No root lies outside the unit circle.
 VAR satisfies the stability condition.

Table 7b: Var Residual Serial Correlation LM Test (Indonesia)

H ₀ : No Serial Correlation		
Lags	LM-Stat	Prob
1	7.700533	0.5646
2	3.664477	0.9321

Probabilities from chi-square with 9 df.

Table 8: Results of Static Long Run Solution (Level Series, Indonesia)

	Y_{idt}^a	Y_{idt}^{ind}	Y_{idt}^{ser}
Y_{idt}^a	...	-0.301(0.819)	0.730(0.044)
Y_{idt}^{ind}	0.099(0.303)	...	0.594(0.274)
Y_{idt}^{ser}	1.016(0.000)	0.797(0.537)	...

Table 9: Granger Causality Test (Level Series Indonesia)

F-statistic (Probability)	Y_{idt}^a	Y_{idt}^{ind}	Y_{idt}^{ser}
Y_{idt}^a	...	1.549(0.231)	0.366(0.696)
Y_{idt}^{ind}	3.23(0.054)	...	3.8(0.033)
Y_{idt}^{ser}	12.77(0.0001)	1.602(0.220)	...

APPENDIX B

Figure 1: One-Step Forecasts of VAR Model (Level Series Pakistan)

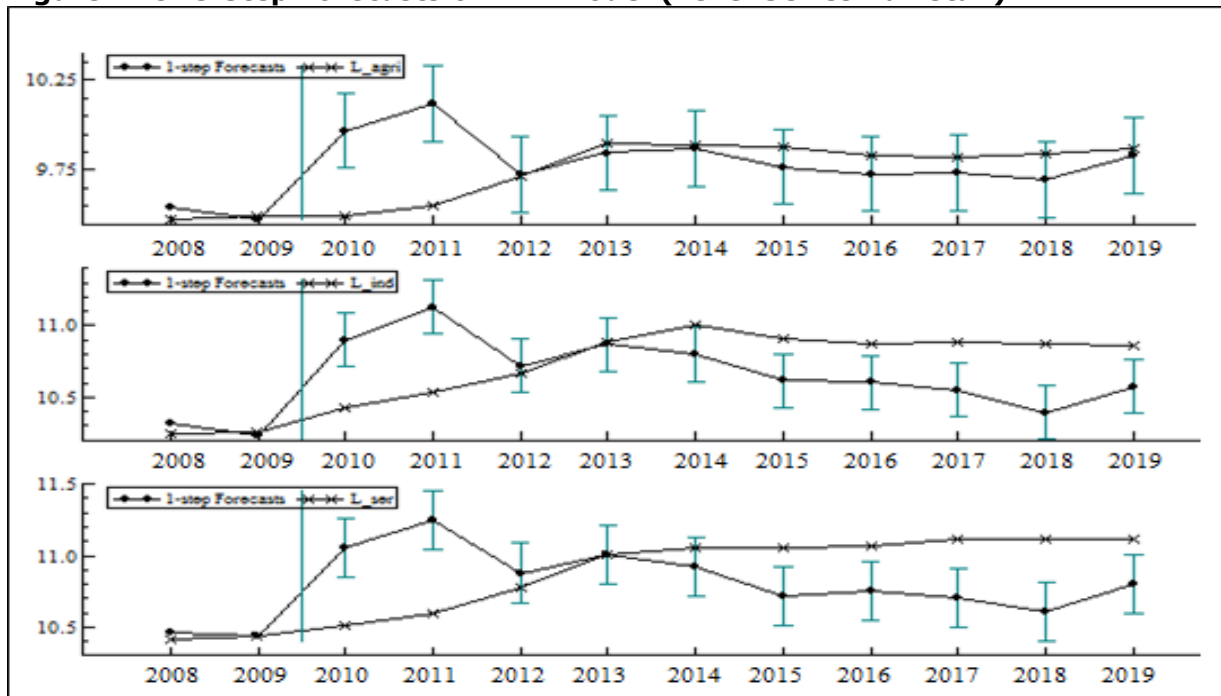
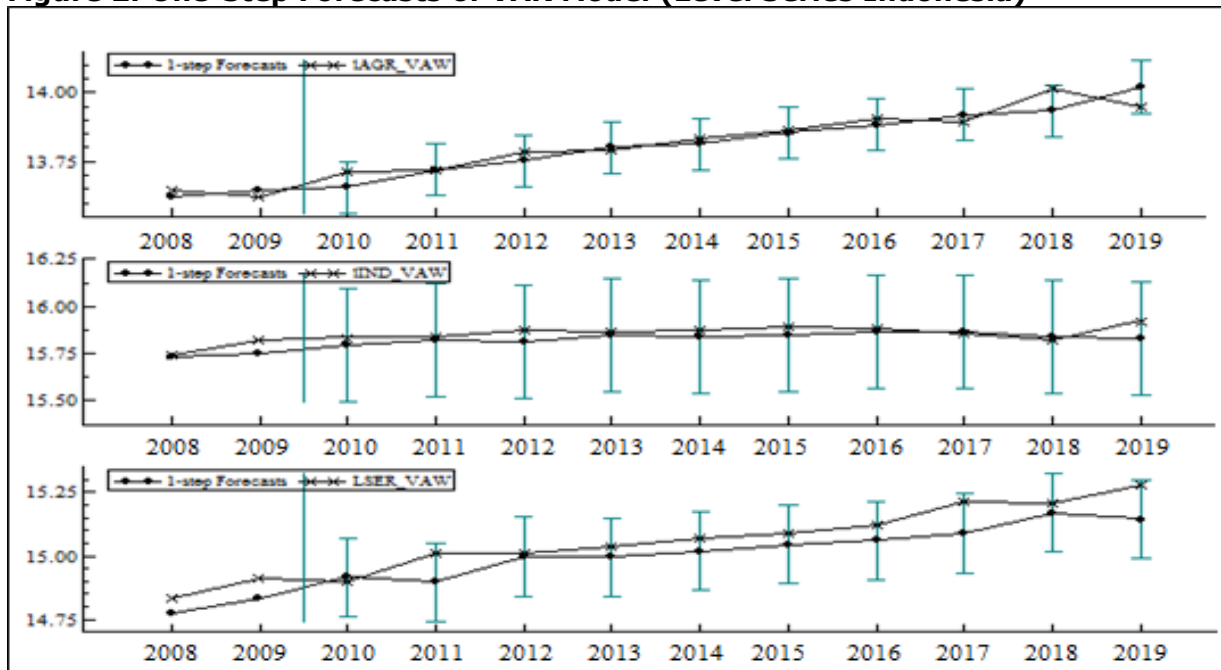


Figure 2: One-Step Forecasts of VAR Model (Level Series Indonesia)



List of Acronyms

Symbol	Definition
agri	Agriculture
ind	Industries
ser	Services
AGR_VAW	Agriculture value-added per worker
IND_VAW	Industries value-added per worker
SER_VAW	Services value-added per worker
P_AGRPK	Productivity in Agriculture sector of Pakistan
P_INDPK	Productivity in industrial sector of Pakistan
P_SERPK	Productivity in services sector of Pakistan
P_AGRInd	Productivity in Agriculture sector of Indonesia
P_INDInd	Productivity in industrial sector of Indonesia
P_SERInd	Productivity in services sector of Indonesia
