A Time Series Analysis of Investigating the Influence of Sectoral Output on Employment in Pakistan

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Abstract
The present study aims at investigating the influence of Sectoral Output (agriculture, industrial and services sector output) on the employment in the Pakistan using annual data ranging from 1972 to 2014. Results are estimated using log-log forms of the equations. The study applies unit root test and has found order of integration as 1. The long run coefficients are estimated using Johansen co-integration test which suggests agriculture; Industrial & Services sectors output and exports as positively linked with employment. Consumer Price Index, Exchange rate and Population may have a positive as well as negative link with employment. Short run results show converges towards the long run equilibrium.
Keywords: Sectoral Output, Employment, Exchange rate, Population, Johansen Co-integration test, Consumer Price Index, Exports
JEL Classification: C13, C32, E24, E31, F18, O47, Q10, L60, P23

1.   Introduction
In Pakistan, the share of employment in agriculture sector is decreasing due to urbanization and people are moving towards other sectors like industrial or services of economy. On the other side the services sector provides various types of jobs such as to highly skilled, semi skilled and unskilled as well. Importance of agriculture sector, industrial sector and services sector cannot be denied. Agriculture has a significant role in generating economic growth and employment in Pakistan. The importance of agriculture we can express in different manners like this sector provides food to consumers, fibers for home industry, it is also a source of scarce foreign exchange earnings and it provides a raw material for industrial goods. Economists state that manufacturing sector is a wealth producing sector for an economy. Manufacturing means production of industrial goods, consumer goods and machineries that is used for production of other goods. Manufacturing sector includes such industries that produce finished, tangible products, fabrication and construction etc. Industrial sector has a significant role in providing employment.

The service sector is one of the portions of the economy that produces intangible goods. Services sector of Pakistan consists of four major sectors. First is Personal Services (Entertainment and Recreation, Ownership and Dwelling); second is Distributive Services (Transport, Storage, Communications, Wholesales, Retail trade, Hotels and Restaurants); third is Producer Services (Financial institution like State Bank of Pakistan, other national banks, Accounting and Purchase and sales brokers) and last is Social Services (Public administration and defense, Social Community and Private services like Education, Health and medical services). The share of services sector in total output and employment in most developed countries is larger than other sectors. It also provides lot of jobs in the economy.

The objective of the study is to determine the effect of Sectoral Output (Agriculture Sector, Industrial Sector and Services Sector) on the Employment in the Pakistan. This study is divided into five sections; first section describes the introduction of the research, Second section summarizes some of the past literature and third section contains Data and Methodology to be used, forth section is related to Results and Discussions, fifth section is equipped with conclusion and policies. Lastly references are given.

2.   Literature Review
The issue of sectoral output linked with employed is discussed many times in Past and current times. The present study considers very few of them to summarize here in this section. Li et. al (2003) explored the benefits of services sector liberalization for creating job opportunities in China by employing CGE model and concluded positive response of services sector liberalization for more job opportunities in all the sectors of economy.

Szirmai (2009) examined the emergence of industries in developing countries using panel data of 63 developing countries for the years 1950 to 2005. The research observed the positive effect of Industrialization Output on economic development. Rendall (2010) explained that rise of services sector in the society raised

female work or employment in Europe and United States. Sparks and Barnett (2010) investigated informal sector as encouraging factor for employment and economic growth.

Sandrey et. al (2011) provided agriculture trade as major factor for employment creation in South African countries. Fimeche and Clive (2011) explored the impact of the use of robots in the industrialized production of goods on employment using time series data from 2000 to 2011. According to the descriptive analysis industrial robots showed positive impact employment. Ajmair and Ahmed (2011) analyzed employment growth in Pakistani services sector due to expanding services sector. Using time series data from 1990 – 2005, the study analyzed that industry and agriculture sector also played vital role in providing employment in Pakistan.

Clainon and Silibaziso (2012) found that unemployment in agriculture was increased due to low investment in this sector in Zimbabwe among youngsters. Umaru and Zubairu (2012) investigated the involvement of agricultural sector and petroleum sector on the economic growth and development (GDP). They used time series data of Nigerian Economy from 1960 to 2010. The authors utilized the Ordinary Least Squares method, Augmented Dickey Fuller technique and Chow Test to estimates the results. The results explained that GDP growth was risen with the increase of Agricultural and petroleum output.

Bansal (2013) explored the impact of services sector on employment and growths according to Indian economy. Services sector had positive relations with Income, employment, output. Suryadarma et. al (2013) developed growth employment model for Indonesian economy and concluded that agriculture sector provided employment in rural areas and services sector was important for creating significant number of jobs.

3. DATA, MODEL AND METHODS
3.1 Data Range and Sources
The study uses annual times series data ranging from 1972 to 2014. In the study, Log-Log forms of the models are utilized to estimate the results. The research collects data on all variables from Hand Book of Statistics on Pakistan Economy 2010 published by State Bank of Pakistan and Economic Survey of Pakistan 2014 – 15 published by Statistical Bureau of Pakistan.

3.2 Methodological Discussion
To estimate the results, the study makes use of following steps for reliable estimates of given models.

i. At first step, unit root test (Augmented Dickey Fuller) is applied to know the order to integration of the variables. If order of integration is "1" or I(1) for all the variables, then Johansen Cointegration test is applicable for long run estimates. If order to integration is "0", I(0) or "1", I(1), then Auto Regressive and Distributive Lag model (ARDL) is employed for the purpose.

ii. At second step, Lag length is examined using Akaike Information Criterion (AIC), Schwarz Information Criterion (SCH) or Hannan – Quinn Information Criterion (HQ) test to use in above mentioned tests.

iii. Third step is about to analyzing short run estimates which are calculated using Vector Error Correction Model (VECM) in either case.

3.3 Model Specification
The study explores the influence of Sectoral Output (Agriculture sector, Industrial sector and Services sector) on employment of Pakistan. On the basis, following employment models are specified as;

$$LEMPL = \alpha_0 + \alpha_1 LAGRI + \alpha_2 LCPI + \alpha_3 LPOP + \alpha_4 LEXP + \alpha_5 LEXR + u_i$$
$$LEMPL = \beta_0 + \beta_1 LIND + \beta_2 LCPI + \beta_3 LPOP + \beta_4 LEXP + \beta_5 LEXR + v_i$$
$$LEMPL = \gamma_0 + \gamma_1 LSER + \gamma_2 LCPI + \gamma_3 LPOP + \gamma_4 LEXP + \gamma_5 LEXR + w_i$$

Where $\alpha's, \beta's, \gamma's$ are parameters and u_i, v_i, w_i are error terms of the regression equation. All variables are taken in natural log forms. Definition of the variables, expected relationships and units of measurement are given in table 1.

Table 1: Definition of variables

Variable	Definition	Expected Relationship	Unit of Measurement
LEMPL	Employed Labor Force	Dependent Variable	Million
LAGRI	Real Agriculture Sector Output	Positive	Million Rupees
LIND	Real Industrial Sector Output	Positive	Million Rupees
LSER	Real Services Sector Output	Positive	Million Rupees
LCPI	Consumer Price Index	Positive	Million Rupees
LPOP	Population	Positive/ Negative	Million
LEXP	Real Exports	Positive	Million Rupees
LEXR	Official Exchange rate	Positive/ Negative	Rupees Per Dollar

4. RESULTS AND DISCUSSION

4.1 Unit Root Test

This section is concerned with establishing the order of integration of each variable applying Augmented Dickey Fuller test (ADF). ADF test statistics conclude that all variables are non stationary in their levels and these are found stationary at first differences (Table 2). So, Johansen Cointegration test may be used for long run estimates.

Table 2: ADF Unit Root Test

Variables	Tests for Unit Root in	Include In Test Equation	Test Statistics		Results
			ADF Test Statistics	ADF Critical Value	
Real Agriculture Output	Level	Intercept	-0.691045	-2.606857	I(1)
		Trend and Intercept	-2.681045	-3.194611	
	1st Difference	Intercept	-6.485004	-2.607932	
Real Industrial Output	Level	Intercept	-0.701096	-2.606857	I(1)
		Trend and Intercept	-2.510449	-3.194611	
	1st Difference	Intercept	-6.395943	-2.607932	
Real Services Output	Level	Intercept	-0.826762	-2.606857	I(1)
		Trend and Intercept	-3.281316	-3.194611	
	1st Difference	Intercept	-5.125179	-2.607932	
Real Exports	Level	Intercept	-1.285373	-2.606857	I(1)
		Trend and Intercept	-1.440600	-3.194611	
	1st Difference	Intercept	-6.799848	-2.607932	
Consumer Price Index	Level	Intercept	-2.252248	-2.606857	I(1)
		Trend and Intercept	-2.867930	-3.194611	
	1st Difference	Intercept	-3.768153	-2.607932	
Population	Level	Intercept	-2.029043	-2.606857	I(1)
		Trend and Intercept	-1.892726	-3.194611	
	1st Difference	Intercept	-5.977934	-2.607932	
Exchange Rate	Level	Intercept	-0.415930	-2.606857	I(1)
		Trend and Intercept	-1.902205	-3.194611	
	1st Difference	Intercept	-4.634274	-2.607932	

4.2   Lag Length Selection Process

The selection of appropriate lag length using proper information criterions is the second step of Johansen Co-integration technique. The Lag Length Selection Process results are reported in table 3 where we use Akaike information criterion, Hannan – Quinn information criterion and Schwarz's Information criterion in our analysis. The Favorable lag length that is selected in current analysis is assumed to be "1" at which the values of information criterions are minimum.

Table 3: Lag length Selection

Lag	Akaike information criterion	Schwarz's Information criterion	Hannan-Quinn information criterion
Agriculture Sector			
0	-5.738679	-5.482747	- 5.646853
1	-18.77692	-16.98539*	-18.13413*
2	-19.17752*	-15.85040	-17.98378
Industrial Sector			
0	-3.602494	-3.346562	-3.510668
1	-15.97263*	-14.18110*	-15.32984*
2	-15.59154	-12.26442	-14.39780
Services Sector			
0	-7.075490	-6.862213	-6.998968
1	-18.73299	-17.45333*	-18.27386*
2	-19.06432*	-16.71827	-18.22258

* indicates lag order selected by the criterion calculated using EViews-7

4.3   Johansen Co-integration Test

In the next step, the study reports number of co-integrated equations using trace statistics and maximum eigenvalue statistics. The analysis rejects the null hypothesis that there is no co-integrating equation according to the probabilities given in tables 4. These explain that there are co-integrated vectors in long run results or high association between explanatory and dependent variables used in current study.

Table 4: Unrestricted Co -integration Rank Test

Hypothesized No. of CE(s)	Trace statistics	Probability	Max-Eigen Statistic	Probability
Agriculture Sector				
None	143.5891	0.0000	44.41896	0.0196
At most 1	99.17013	0.0004	32.29993	0.0967
At most 2	66.87020	0.0024	25.84076	0.1078
At most 3	41.02945	0.0105	23.81589	0.0305
At most 4	17.21355	0.1247	11.77437	0.1994
At most 5	5.439189	0.2387	5.439189	0.2387
Industrial Sector				
None	145.5754	0.0000	45.43042	0.0147
At most 1	100.1449	0.0003	32.39922	0.0943
At most 2	67.74573	0.0019	25.02844	0.1334
At most 3	42.71729	0.0064	24.91857	0.0210
At most 4	17.79872	0.1054	12.36372	0.1658
At most 5	5.435001	0.2391	5.435001	0.2391
Services Sector				
None	104.7104	0.0001	36.80017	0.0285
At most 1	67.91026	0.0018	25.58386	0.1154
At most 2	42.32640	0.0072	22.33603	0.0494
At most 3	19.99037	0.0544	15.15813	0.0649
At most 4	4.832243	0.3023	4.832243	0.3023
At most 5	5.235001	0.2191	5.335001	0.2291

4.4   Long run Results

Johansen Results of all sectors are reported in table 5. Variables, coefficients, standard errors and t-statistics are displayed in 1st, 2nd, 3rd and 4th columns and 5th column concludes the significance of all the variables.

There are positive relationship between real Agriculture output and Employment. The t – ratio is higher than 2 so relationships is significant as well. One percent increase in the Real Agriculture output will rise employment by 0.15 percent. When there will be an increase in the agriculture more labor will be required to produce more agriculture output so employment will increase. These results are matched with previous findings of Sandrey et. al (2011), Bansal (2013) and Clainon and Silibaziso (2012). The study finds positive relationship between Employment and industrial sector output. This variable is significant at 1 percent level of significance with positive value. One percent increase in real industrial sector output increases employment by 0.05 percent. When industrial sector output increase at a large scale, they require more labor so employment will increase. Same relationship has been established by Fimeche and Clive (2013) and Szirmai (2009) and Bansal (2013). Services sector output is also positive with employment having significant coefficient value. On average one percent increase in the services sector output brings 0.69 percent rise in employment. When services sector expands, more jobs are created in the economy that will increase employment level of a country. Our findings are corresponding with previous conclusion of Bansal (2013), Li et.al (2003), Rendall (2010) and Suryadarma et. al (2010).

Consumer price index is tended to raise Employment of Pakistan but with insignificant coefficient value in agriculture and industrial sector output models. The reason may be that when CPI increases, the prices of the consumer products increase the profits of the producers. So the producers, in order to earn more profits will increase their production. For that purpose, they require more labour force. So increasing demand for labour force will raise employment in the economy. There is positive relationship found between employment and consumer price index in services sector model. It is significant with negative coefficient value. One percent rise in CPI would lower 0.65 percent Employment of Pakistan on the average. The reason may be that when CPI raises, overall level of prices increases, purchasing power of people and demand will also decrease. Then there will be lesser demand for goods and services. Due to lower demand, production falls and it affects employment negatively. Ajmair and Ahmed (2011) and Rendall (2010) establish the same relationship in their studies.

With regards to Exchange rate, it is having inverse effects on Employment. In agriculture model, sign of coefficient is insignificant. In industrial sector model, exchange rate is tended to increase employment of Pakistan. It is significant with positive value. Due to one percent depreciation of Exchange rate, there would be 0.22 percent enrichment in Employment. The reason may be that when exchange rate depreciates, demand for exports increase, so in order to fulfill demand of foreigners they will produce more output. Then they will have to hire labor so employment will increase in this respect. In the same way the study includes also third sector's output association with employment.

Exports are found to increase employment of Pakistan in all models. It is significant as well with positive value. On the average, one percent increase in Exports proposes 0.22, 0.14 or 0.12 percent enhancement in Employment in agriculture, industrial and services sector models respectively. When Exports increase, the profit of the producer increase which will induce them to produce more. To produce more, they require more labor. It will raise employment of Pakistan. Same relationship was established by Umaru and Zubairu (2012) and Sandrey et. al (2011).

There is found positive relationship between Population and Employment. It is significant with positive value in agriculture model. The Employment increases by 0.05 percent due to one percent increase in Population. If population increases, there would be increase in demand for goods and services. To fulfill demand, production will increase. This creates demand for labor in the economy hence employment will increase. In industrial and services sector models, population and employment are negatively related. The negative value may be justified as when population increases, per capita income decreases, saving will decrease which would lead to a reduction in investment. Decrease in investment lower business activities. In a result, employment opportunities will fall.

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Table 5:   Long run results

Variables	Coefficient	Standard error	t-value	Conclusion
Agriculture sector				
Real agriculture	0.151097	0.02606	5.7980	Significant
Export	0.226140	0.04383	5.15947	Significant
Exchange Rate	-0.379240	0.24105	-1.57328	Insignificant
Population	0.058085	0.01535	3.78403	Significant
CPI	0.102392	0.05661	1.80872	In Significant
Constant	-2.698230	0.75405	-3.5783	Significant
Industrial Sector				
Real industrial	0.055613	0.01611	3.45207	Significant
Export	0.142009	0.02510	5.65772	Significant
Exchange Rate	0.224410	0.04366	5.13994	Significant
Population	-0.348247	0.25273	-1.37794	In Significant
CPI	0.090177	0.05536	1.62891	In Significant
Constant	-2.674155	0.79936	-3.34537	Significant
Services Sector				
Real services	0.694393	0.06750	10.2873	Significant
Export	0.126140	0.02383	5.29332	Significant
Exchange Rate	0 .037671	0.03875	0.97215	Insignificant
Population	-0.990555	0.20050	-4.94042	Significant
CPI	-0.659031	0.09504	-6.93424	Significant
Constant	-1.506846	0.51485	-2.92675	Significant

4.5   Short run Results

Vector error correction model (VECM) gives the short run results reported in table 6. This table explains the values of coefficients without brackets, values in round brackets are standard errors and values in square brackets are denoting t – statistics. In the short run, the speed of adjustment term is the most important thing and it shows that how much time would be taken by the economy to reach at long run equilibrium due to any disturbance. The economy will converge towards long run equilibrium when there is negative sign with speed of adjustment term. Positive sign shows that economy diverges from long run equilibrium. In results, the economy converges towards the long run equilibrium due to any disturbance in the short run.

Table 6: Error Correction Results

Variables	Model 1 D(LELF)	Model 2 D(LELF)	Model 3 D(LELF)
Speed of Adjustment Term	-0.080662	-0.078188	-0.564283
	(0.15744)	(0.16005)	(0.17197)
	[-0.51235]	[-0.48851]	[-3.28121]
D(LELF(-1))	-0.221547	-0.209907	-0.103750
	(0.26848)	(0.27057)	(0.16787)
	[-0.82518]	[-0.77578]	[-0.61802]
D(LELF(-2))	0.153679	0.143372	0.199790
	(0.29703)	(0.30657)	(0.19256)
	[0.51739]	[0.46766]	[1.03753]
D(LRAGRI(-1))	0.009323	---	---
	(0.01882)		
	[0.49533]		
D(LRAGRI(-2))	0.013189	---	---
	(0.02015)		
	[0.65469]		
D(LRINDS(-1))	---	0.008726	---
		(0.02022)	
		[0.43161]	
D(LRINDS(-2))	---	0.016343	---
		(0.02137)	
		[0.76493]	
D(LSERV(-1))	---	---	-0.336960

			(0.14098)
			[-2.39005]
D(LSERV(-2))	---	---	-0.244338
			(0.15260)
			[-1.60121]
D(LCPI(-1))	0.045852	0.046791	0.258821
	(0.08429)	(0.08255)	(0.08822)
	[0.54398]	[0.56681]	[2.93386]
D(LCPI(-2))	0.039163	0.043770	0.181498
	(0.12487)	(0.12442)	(0.13474)
	[0.31364]	[0.35179]	[1.34699]
D(LEXPORT(-1))	-0.009323	-0.009219	
	(0.02213)	(0.02176)	---
	[-0.42121]	[-0.42368]	
D(LEXPORT(-2))	0.024876	0.026221	
	(0.03001)	(0.02954)	---
	[0.82889]	[0.88771]	
D(LEXRATE(-1))	0.131051	0.129285	0.271553
	(0.16053)	(0.16451)	(0.12474)
	[0.81639]	[0.78587]	[2.17697]
D(LEXRATE(-2))	-0.126551	-0.119493	-0.074533
	(0.11362)	(0.11417)	(0.08728)
	[-1.11378]	[-1.04661]	[-0.85398]
D(LPOP(-1))	-0.628888	-0.620031	-0.004594
	(0.70792)	(0.69408)	(0.42809)
	[-0.88835]	[-0.89332]	[-0.01073]
D(LPOP(-2))	-0.588697	-0.593792	-0.273331
	(0.58570)	(0.57367)	(0.44824)
	[-1.00511]	[-1.03507]	[-0.60979]
Constant	0.050022	0.048290	0.073417

5.   Concluding Remarks

The objective of the study is to determine the effect of sectoral output on the employment in Pakistan. For sectoral output, the study considers Agriculture sector output, Industrial Sector Output and Services sector output. Employed labor force is taken as proxy of employment in Pakistan. To fulfill the objective, the study utilizes times series data ranging from 1972 to 2014. Log - Log forms of the equations are used to estimate more reliable results. The data is obtained from reliable sources of Government of Pakistan like Hand Book of Statistics on Pakistan Economy 2010 published by State Bank of Pakistan and Economic Survey of Pakistan 2014 – 15 published by Federal Bureau of Statistics.

For Estimation of results, stationarity of the data is examined using Augmented Dickey Fuller (Unit Root Test) at first step and concluded order of integration I(1) for all the variables. At second step, lag length is selected as 1 by using Akaike Information Criterion, Schwarz Information Criterion and Hannan – Quinn Information Criterions. Long run relationship is analyzed using Johansen Co-integration test and short run relationship is investigated by using Vector Error Correction Model at third and forth steps.

Trade Statistics and Maximum Eigen Statistics established long run relationship among all the variables of the models. Econometric results suggest that real agriculture sector output, real Industrial sector output, real Services sector output and Exports have positive link with employment of Pakistan. Exchange rate, Population and consumer price index is found to have negative as well as positive link employment of Pakistan in the long run. Error correction model results demonstrate convergence towards long run equilibrium due to any short run disturbance.

On the basis of results, it may be suggested that expansion of exports, agriculture sector, industrial sector and services sector is necessary for the economic development and employment generation. There should be flexible exchange rate policy to be adopted by the Government for the long run to have stability in it. Inflation greases the economy well if it remains in certain limits. Single digit inflation is considered as good for the economy. Population growth is not having any problem for the economy if it is utilized in right direction of growth and development.

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