

AGRICULTURE VALUE ADDED AND INCOME INEQUALITY IN PAKISTAN: A TIME SERIES ANALYSIS

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ABSTRACT

Income inequality is very important for the growth and poverty alleviation in an economy. This analysis examines the impacts of agriculture value added, service sector value added, exports of goods and services and foreign direct investment as percentage of GDP on income inequality measured by Gini coefficient in Pakistan. In this examination, ADF unit root test is applied to find each time series variable stationary at its first difference. Johansen's cointegration approach is applied to analyze the long run determinants of income inequality. All the explanatory variables are found to negatively and significantly affect income inequality in long run except service sector value added. The service sector value added showed a positive impact on income inequality but this result is insignificant. Error Correction Model is also applied for the analysis of short run dynamics of income inequality. The study also provides some policy implications for the improvement of infrastructure, macroeconomic environment, abolition of corruption, to get rid of terrorism, construction of new dams and develop a robust education and technical training system for the development of human capital in the country.

JEL CLASSIFICATION & KEYWORDS

■ C32 ■ O13 ■ O15 ■ AGRICULTURE VALUE ADDED
■ INCOME INEQUALITY ■ UNIT ROOT ■ COINTEGRATION
■ CAUSALITY

INTRODUCTION

Employment generation, poverty reduction and equal distribution of income are major objectives of development policy of any government. Equal distribution of income provides the stability in an economy by providing the opportunities to the individuals of the society to equally benefit from the growth and development of the economy. In the process of growth, the productive capacity of the economy is increased. This growth of the economy would benefit everyone if the distribution of income is equal in the economy. On the other hand, with the higher income inequality the lesser portion of population would benefit from the process of development. Kuznets (1955), in the pioneer study in income inequality and growth relationship, concluded an inverted U-shaped relationship between growth and income inequality of the country. This empirical finding is known as "Kuznets' Hypothesis" in economic literature. According to Kuznets hypothesis, distribution of income worsens at early stages of growth but income inequity start declining at higher growth levels. Following the Kuznets a large number of researchers focused on the relationship between growth and inequality. Pukerit (1973) and Ahluwalia (1976) supported the Kuznet's hypothesis. Some of the studies concluded a negative relationship between growth and income inequality [Anand and Kanbur (1993); Persson and Tabellini (1994); Perotti (1996)]. Som

studies found a positive and ambiguous relationship between growth and distribution of income [Li and Zou (1998); Forbes (2000); Barro (2000)]. The results of Ravallion (1995) and Deininger and Squire (1998) could not support Kuznet's point of view. Hafeez (2008) supported the hypothesis, for the Pakistan economy, that income inequality increases in the earlier stages of growth and then it decreases after a certain level of growth.

Chaudry (1982) is of the view that the green revolution helped to reduce income disparities in Pakistan. He concluded that productivity level and income of small farmers increased more rapidly than that of large farmers. The introduction of new technology in agriculture sector increased the demand for labor that helped to increase the wages of rural workers. Green revolution also resulted in changing the social political and economic environment of the country. Amjad and Ahmad (1984) gave conclusions in contrast to Chaudhry (1982) that income inequality increased in the process of green revolution in Pakistan because the advance technology and credit was available to big landlords. Financial restraints to small farmers entailed them to benefit from HYVs seeds, adequate water, and fertilizers due to higher initial costs. Regional disparities also increased during the process of green revolution. Growth of agriculture sector generates employment opportunities.

Krongkaew (1985) concluded that rapid economic growth helped to increase the real incomes of the households. The author was also of the view that agriculture growth helped to alleviate poverty in Thailand. Further, the author was of the view that the improvement in the living standard of rural households was due to the less reliance on the subsistence agriculture sector and increase in income obtained from the sale of farm products. The wage and salary income increased at the expense of entrepreneurial and farm income as share of money income. A robust growth in the decade of sixties has had a positive impact on the living standards in Pakistan. According to Ahmad and Ludlow (1989) adaptation of new technologies by the middle farmers in the process of Green Revolution, remarkable investments in infrastructure development, subsidized inputs helped to generate sustained growth in 1960s helped reduce inequality and poverty. Adams and He (1995) found landownership more skewed than the income inequality in Pakistan. The authors identified non-farm, agricultural, transfer, livestock and rental income as the sources of income in rural Pakistan. Non-agriculture income constituted 30-34 percent total per capita income.

Adams and He (1995) found that poor households receive 50 percent of their income from non-farm sources where as they received less than 10 percent of their income from agriculture sector. On the other hand, the households in richest quintile obtained more than 36 percent of their total per capita income from the farm sector. Adams and He (1995) also examined the share in income inequality of each source of income. Agricultural income accounted for 35-45

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percent of income inequality in Pakistan. This was due to the skewed land ownership and agriculture income, in Pakistan, was correlated to land ownership. Livestock contributed 1-11 percent to income inequality in Pakistan. The study also explored that income from the major cash crop had a large and negative impact on income inequality while income from main food crops like wheat and rice was concluded to have equalizing effect on income inequality.

Livestock is the major source of agriculture value added and source of income to the rural Pakistan. Adams (1996) used decomposition technique to examine the impact of livestock income on the improvement of rural income distribution. Adams (1996) found livestock income to reduce income inequality in Pakistan. The study also concluded that agriculture income to be largest contributor to overall income inequality due unequal distribution of land in the economy. Naschold (2009) also concluded land ownership to be more important for the determination of income inequality level rather than its changes in Pakistan. According to Chaudhry and Chaudhry (1997), in Pakistan, poverty and income distribution trends varied directly with the agriculture growth. The authors concluded that agriculture growth of 5 percent or higher showed a positive impact on income distribution and poverty in the economy. The lower rate of growth of agriculture crops could not help to generate employment opportunities for the growing labor force.

The lack of employment opportunities has adverse impacts on rural poverty and income inequality, Chaudhry and Chaudhry (1997). Low prices of agriculture commodities and high input prices contributed to increase in poverty and income inequality among the farmers of the country. Timmer (1988) is of the view that the long run trends the prices of agriculture commodities as compared to the prices of agricultural inputs affect the expectations of the investors, technology and agriculture production growth. Moreover the intersectoral terms of trade movements affect rate of employment rate, distribution of income and social welfare levels in the economy, Brown (1978). Datt and Ravallion (1996) are of the view that growth in agriculture sector helped to reduce rural and urban poverty in India where as rural economic growth did not showed a poverty reduction impacts. Gallup et al. (1997) concluded that the income of the poorest 20 percent increased by 1.61 percent with the 1 percent growth in per capita agricultural GDP.

The manufacturing sector showed lesser impact on the income of the lowest 20 percent. The cross-country regression analysis of Thirtle et al. (2001) concluded that the productivity gains in agriculture sector showed a stronger correlation with the poverty reduction than the other sectors of the economy. The cross-country analysis concluded that 1 percent growth in labor productivity in agriculture sector declined poverty levels by 0.6-1.2 percent. Economic growth helps to reduce poverty but the growth in the agriculture sector is more effective in the betterment of the poor in rural areas, Thirtle et al. (2003). The author is of the opinion that agriculture growth is pro-poor in Africa and Asia. Agricultural and agro-industrial sector play very important for the alleviation in the economy and improvement in the distribution of income, ORyan and Miller (2003). According to ORyan and Miller (2003) the effects of an increase in productivity of labor in agriculture have been more on the lowest income deciles than that of the industrial sector in Chilean economy. The green revolution increased employment opportunities, productivity and GDP of the Pakistan economy, Ahmad et al. (2004). Mehrgan and Nassabian (2010) rejected Kuznets hypothesis by using data of the Iranian economy for the period 1968-2003. The study concluded a negative relationship between agriculture

sector growth and income inequality, that is, income inequality in Iran decreases with the increase in share of agriculture value added in the GDP. Oyekale et al. (0000) is of the view that income inequality in rural areas of Nigeria was more than that in urban areas. Rural income inequality was affected by agriculture and wage income where as wage and non-agriculture income contributed to urban income inequality.

Agriculture sector has been the major contributor in GDP of the Pakistan. Most of the population lives in the rural Pakistan. Major source on income is farm income. The growth and development of agriculture sector help to improve the living standards of the masses. The current study is an attempt to examine the impact of agriculture value added on income inequality in Pakistan for the period 1972-2007. The paper is designed as: section II comprises of a brief review of the explanatory variables included in the model. Model specifications and methodology are discussed in the section III. Data source and results and discussion are placed in section IV and V respectively. Section VI comprises of conclusions and policy implication. References are presented at the end of the paper.

Agriculture Sector and Income Inequality: A Brief Profile

Agriculture sector is considered to be the backbone of the economy in Pakistan. It is one of the major sectors that contribute to the GDP. Agriculture value added, services value added, exports of goods and services and FDI are discussed briefly in the following sub-sections.

Agriculture Value Added

Agriculture sector is the one of the major sectors of the Pakistan economy since more than 60 percent of the population lives in rural areas, 45 percent of labor force is employed by the agriculture sector and it contributes 21 percent of the GDP in Pakistan economy, [Economics Survey, 2009-10]. More than 30% of the population is living under the poverty line in Pakistan and a larger number of out of these poor lives in the backward and underdeveloped rural areas of Pakistan. These people are living in vulnerable conditions of malnutrition, illiteracy and lack health facilities [ADB, 2001].

Agriculture sector in Pakistan, during the early 5 years of seventies has been 0.78% where as it showed an increasing trend in the second half of the same decade. The figures of the share of agriculture sector into the GDP of Pakistan economy and growth rates of agriculture sector and its sub-sectors are given in Table 1 and 2 respectively. The share of agriculture sector though declined as compared to that in 1970s but still it contributes to more than 20 percent on the GDP of Pakistan. Agriculture sector grew at 4 percent during 1991-2000 period.

Having a look on the agriculture sector, in Pakistan, share of GDP economy has declined over the years as the share of agriculture in the GDP has declined from 38.9 % in 1969-70 to 21.8% in 2008-09(see Table 1). Though the agriculture share of GDP declined over the years but agriculture sector has been a major sector of Pakistan economy. Agriculture sector consists of major and minor crops, livestock fishing and forestry. The growth rate of agriculture sector remained negative in 2000-02 period that was due to the major shortfall of water. The prevalent long dry spell caused a negative trend in the growth of major and minor crops [Economic Survey, 2001-02]. Livestock sector contributed 10.6% of the GDP in 1969-70 but its share in the GDP increased to 12% in 2001-02(see Table 1). Where as share of fishing and forestry stood at 0.3% and 0.7 percent of the GDP.

Year	Agriculture	Major Crops	Minor Crops	Livestock	Fishing	Forestry
1969-70	38.9	23.4	4.2	10.6	0.5	0.1
1998-99	25.4	10.3	4.9	9.3	0.9	0.1
1999-2000	25.9	11.5	4.2	9.1	0.9	0.1
2000-01	24.6	10.1	4.1	9.3	0.9	0.3
2001-02	24.1	8.0	3.1	12.0	0.3	0.7
2002-03	24.0	8.2	3.0	11.8	0.3	0.7
2003-04	22.9	7.8	2.9	11.2	0.3	0.6
2004-05	22.4	8.4	2.8	1.6	0.3	0.4
2005-06	22.5	7.6	2.6	11.6	0.3	0.4
2006-07	21.9	7.7	2.4	11.1	0.4	0.3
2007-08	21.3	6.9	2.6	11.1	0.4	0.3
2008-09	21.8	7.3	2.6	11.3	0.4	0.2

Source: Economic Survey (1990-91, 2001-02, 2008-09)

Year	Agriculture	Major Crops	Minor Crops	Livestock	Fishing	Forestry
1980s	5.4	3.4	4.1	5.3	7.3	6.4
1990s	4.4	3.5	4.6	6.4	3.6	-5.2
2000-01	-2.6	-10.3	-0.1	5.3	-3.7	9.6
2001-02	-0.1	-1.8	-1.8	3.7	-12.0	-1.3
2002-03	4.1	6.8	1.9	2.6	3.4	11.1
2003-04	2.4	1.7	3.9	2.9	2.0	-3.2
2004-05	6.5	17.7	1.5	2.3	0.6	-32.2
2005-06	6.3	-3.9	0.4	15.8	20.8	-1.1
2006-07	4.1	7.7	-1.0	2.8	15.4	-5.1
2007-08	1.1	-6.4	10.9	4.2	9.2	-11.5
2008-09	4.7	7.7	3.6	3.7	2.3	-15.7

Source: Economic Survey (1990-91, 2001-02, 2008-09)

In 2004-05 agriculture sector showed recovery and it grew at the rate of 6.5% (see Table 2). It contributed the 22.4% of the GDP during the same period. The growth of the agriculture declined in 2005-06 because of negative trends in the growth of major crops and forestry (see Table 2). Major crops showed a negative growth of 3.9 percent in 2005-06 as compared to robust growth of 17.7% in 2004-05. The major crops constitute 35.2 % of the agriculture value added. The sub-sectors like Fishing and livestock showed a remarkable growth of 20.8% and 15.8% respectively. Livestock sector accounted for 49.6% of the agriculture value added in 2005-06 [Economic Survey, 2005-06].

Agriculture sector growth declined in the 2007-08 period due to growth of 6.4% and 11.5% in major crops and forestry respectively. But in 2008-09 the GDP showed a growth of 4.7% it was due to the robust growth of 7.7% in major crops and major crops constituted 33.4% of the agriculture value added. The forestry sector has been showing negative trends for 6 six years that points out the degradation of forests that would lead to sever socio-economic problems for coming generations. The performance of agriculture sector has been mixed as in 2000-02 period it showed negative growth then it showed an increase in its growth in 2004-05. The GDP growth declined in 2007-08 and again it showed a stellar growth of 4.7% in 2008-09.

Service Sector

Service sector is the largest contributor in the GDP of the Pakistan economy. The services sector includes whole sale and retail trade, transport, storage and communication, insurance and finance, public administration and defense, ownership of dwellings and social services, [Economic Survey, 2007-08]. The share of this sector in the GDP has

increased over time as it contributed 38.4, 48.9, and 49.1 percent of the GDP in 1969-70, 1998-99 and 1999-2000 respectively (see Table 3). The share of services sector increased to 53.8 percent in 2008-09 from 50.2 percent in 2000-01(see Table 3).

Year	Share in the GDP	Growth Rate
1969-70	38.4	NA
1998-99	48.9	NA
1999-2000	49.1	NA
2000-01	50.2	4.8
2001-02	52.1	5.1
2002-03	52.3	5.2
2003-04	51.6	5.9
2004-05	51.3	8.0
2005-06	51.7	8.8
2006-07	51.8	7.0
2007-08	53.0	6.6
2008-09	53.8	3.6

Source: Economic Survey (1990-91, 2001-02, 2008-09)

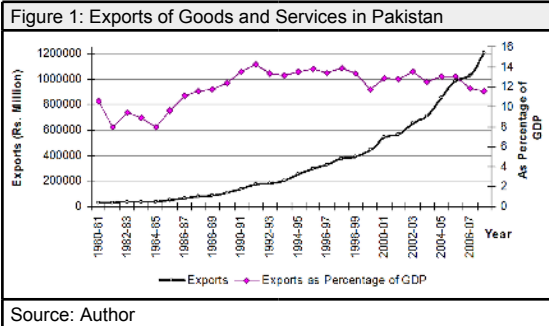
In Pakistan, services sector has been growing faster than the commodity sector. This sector grew at the rate of 5.1 percent in 2001-02 as compared the 4.8 percent growth in 2000-01. The growth in service sector contributed in the growth of the Pakistan economy it grew with the robust growth rate of 5.9, 8.0 and 8.8 percent in 2003-04, 2004-05 and 2005-06 respectively. The good performance of insurance and finance, whole sale and retail trade and transport accelerated the growth of services sector,

[Economic Survey, 2005-06]. This increasing trend in service sector growth reversed during 2006-07 to 2008-09 period as its growth rate declined to 3.6 percent in 2008-09. Banking and financial sector, in Pakistan, felt the heat of the international financial crises and its growth slowed down to 12.9 percent in 2007-08 but this sub-sector showed negative growth of 1.2 percent in 2008-09. Decelerated growth in sub-sectors of transport, storage and communication, transportation, whole sale and retail trade compelled service sector growth to be low in 2008-09. Despite all this service grew on average annual growth rate of 6.6 percent since 2003-04, [Economic Survey, 2008-09].

Exports of Goods and Services

Exports of goods and services has played major role in the development and growth of the economy. Figure 1 presents the trends of exports of goods and services and share of goods and services as percentage of GDP for the period of 1980-81 to 2007-08. The share of exports as percentage of GDP declined during the first half of the 1980s as the share of exports declined from 10.5 percent in 1980-81 to 8 percent in 1984-85. The share of exports as percentage of GDP started increasing in the latter years of the decade and stood at 12.4 percent in 1989-1990. The volume of exports increased from Rs. 29280 million in 1980-81 to Rs. 106469 million.

Exports of goods and services showed an annual growth rate of 6 percent during the decade of 1990s and exports of goods and services has been 13.6 percent of the GDP during the same period. During the second half of the decade exports remain stagnated due to the misalignment of exchange rate, concentration of exports in few products and their low prices due to low value addition, and economic sanctions as results of nuclear explosions [Economic Survey, 2000-01].



Source: Author

The drastic event of September 11 slowed down the pace of economic activity all over the globe caused a reduction in demand for Pakistani products. Sound macroeconomic policies, structural reforms, sustained growth in the world economy helped exports to growth at an average growth of 16.45 percent from 2001-2002 to 2005-06. The exports as percentage of GDP showed a declining trend in the 8 years of the decade as it declined from 12.9 percent in 2000-01 to 11.6 percent in 2007-08. The volume of exports stood at Rs. 1196638 million in 2007-08.

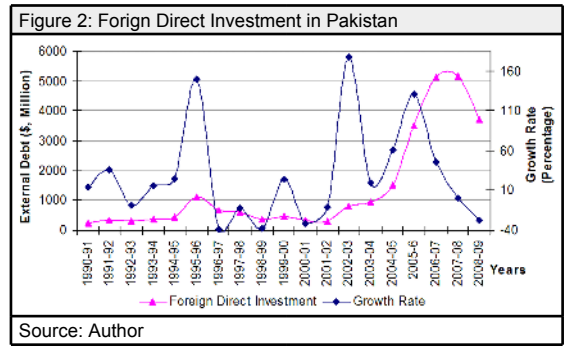
Foreign Direct Investment

Foreign Direct Investment (FDI) has played very critical role in the growth, poverty reduction and to raise living standards in the developing countries. The economies with open trade and investment scenarios, macroeconomic stability, physical and human infrastructure attract inflows¹ of FDI.

¹ Khan (2007) discusses the role of human capital to attract FDI in South Asian Countries.

The countries with developed human capital attract FDI inflows. FDI, in Pakistan increased from \$246 million in 1990-91 to \$335.1 million in 1991-92 at the growth rate of 36.22 percent. The trends of FDI and its growth rate are displayed in the Figure 2.

FDI increased at an annual rate of 16.4 in first half of the 1990s in second half of the decade FDI, in Pakistan, decreased due to the East Asian financial crises, saturation of investment in the energy sector, the freezing of external currency accounts after nuclear explosions, low foreign exchange reserve levels, and default threat on external obligations, [Economic Survey, 2001-02]. FDI showed highest growth performance of 177.66 percent in 2002-03 as it increased from \$287.4 million in 2001-02 to \$798 million in 2003-02. That was due to the increased inflow on FDI in financial business, mining, oil and gas exploration, trade, transport, and storage and communication sector.



Source: Author

Reforms and policies that have been pursued over the last seven years started paying dividends as FDI flows started increasing. A major share of the FDI has been telecom sector. The deterioration in security environment in Pakistan affected the inflows of FDI into the economy as growth started declining in 2005-06. The growth rate in FDI became even negative. FDI is very important for the development of an economy. FDI is a non-debt financial flow. FDI helps an economy to fill the saving-investment gap in the economy and it also results in technological spillovers, improvement in the human capital, sets a good business environment and promotion of entrepreneurial developments [Economic Survey, 2008-09].

The Model and Methodology

This study is an attempt to explore the impacts of agriculture value added, services value added, exports of goods and services and Foreign Direct Investment (FDI) on income inequality measured in terms of Gini coefficient in Pakistan. Our model is

$$GINI = \alpha + \beta_1AVGDP_t + \beta_2SVGDP_t + \beta_3EGSGDP_t + \beta_4FDI_t + v_t$$

- Where
- GINI = Gini Coefficient
- AVGDP = Agriculture Value Added as a Percentage of GDP
- SVGDP = Services Value Added as Percentage of GDP
- EGSGDP = Exports of Goods and Service as a percentage of GDP
- FDI = Foreign Direct Investment as percentage of GDP
- v_t = Error term

The study applies unit root test, Johansen's Cointegration approach and Error Correction Model for the analysis. Since the time series data is used for the analysis, most of the time

series are found to be non-stationary. A time series is supposed to be non-stationary if its mean, variance and autocorrelation is time variant and a non-stationary time series may produce spurious regression, that is, t-ratios and adjusted R-Squared become overestimated in the regression models with the non-stationary time series, Phillips (1986).

Dickey-Fuller test is used to check the stationarity of the time series when error terms are uncorrelated but when error term become correlated then Augmented Dickey-Fuller (ADF) unit root test is used, Dickey and Fuller (1979). This study employs ADF test on each time series on level and first difference without intercept and trend, with intercept but no trend, with drift and trend. The equation of each case is given as:

Without Intercept and Trend:

$$\Delta y_t = \Phi y_{t-1} + \phi_i \sum_{i=1}^p \Delta y_{t-1} + \varepsilon_t \quad (1)$$

With Intercept and no Trend:

$$\Delta y_t = \sigma_1 + \Phi y_{t-1} + \phi_i \sum_{i=1}^p \Delta y_{t-1} + \varepsilon_t \quad (2)$$

With Intercept and Trend:

$$\Delta y_t = \sigma_1 + \sigma_2 t + \Phi y_{t-1} + \phi_i \sum_{i=1}^p \Delta y_{t-1} + \varepsilon_t \quad (3)$$

In each case, our null hypothesis is that $\Phi = 0$ against the alternative hypothesis of $\Phi < 0$. If the null hypothesis is rejected it is concluded that time series is stationary. If all the time series are stationary at their first difference then they are cointegrated, that is, there exists a long run relationship among the variables, Granger (1986). We have used Johansen's cointegration test because Johansen's cointegration test can be applied when there are three and more than three variables in the model². Johansen (1988) developed Vector Autoregressive (VAR) model to ascertain the long run relationship between the variables. Johansen and Juselius (1990) further extended the VAR model. Maximum Likelihood testing procedure on the number of cointegrating vectors has been developed by Johansen (1988) and Johansen and Juselius (1990). The starting point of Johansen's cointegration procedure is VAR of order p as follows:

$$y_t = \kappa + T_1 y_{t-1} + T_2 y_{t-2} + \dots + T_p y_{t-p} + \mu_t \quad (4)$$

Here y_t is $n \times 1$ vector of variables integrated of order one, μ_t is $n \times n$ vector of innovations.

In general VAR (p) can be written as³:

$$\Delta y_t = \kappa + H y_{t-1} + \sum_{i=1}^{p-1} H_i \Delta y_{t-i} + \mu_t \quad (5)$$

Here $H = -(I - \sum_{i=1}^k T_i)$ and $H_i = -\sum_{j=i+1}^k T_j$

The rank of H is the number of cointegrating vectors. If the rank of H is zero it means zero cointegrating relationships. If the rank of H equals n implies that there are n cointegrating relationships. If there are multiple cointegrating vectors then $1 < \text{rank}(H) < n$.

Johansen's cointegration test provides two test statistics, trace value and Maximum Likelihood ratio to identify the number of cointegrating vectors. We have used maximum likelihood ratio to test the null of 'r' cointegrating vectors

against the alternative hypothesis of 'r+1' cointegrating vectors. Maximum likelihood ratio is defined as:

$$\Lambda_{\max}(r, r+1) = -\Theta \ln(1 - \hat{\Lambda}_{r+1}) \quad (6)$$

Here, Λ is estimated value of characteristic roots that are also named as Eigen values and Θ is total number of observations. When two variables are cointegrated, then the relationship between the variables can be expressed as Error Correction Mechanism (ECM), Engle and Granger (1987). ECM

$$\Delta LGINI_t = \Omega + \delta_0 \sum_{i=1}^m \Delta LGINI_t + \delta_1 \sum_{i=1}^p \Delta Z_{1t} + \delta_2 \sum_{i=1}^p \Delta Z_{2t} + \dots + \delta_n \sum_{i=1}^p \Delta Z_{nt} + \gamma \varepsilon_{t-1} + \zeta_t \quad (7)$$

Here Δ is first difference operator; ζ_t is white noise error term.

$$\varepsilon_{t-1} = LGINI_t - \Omega - \delta_1 Z_{1,t-1} - \delta_2 Z_{2,t-1} - \dots - \delta_n Z_{n,t-1} \quad (8)$$

It is one time lagged value from cointegrating regression.

Data Sources

In the present study, we have used time series data of all the variables included in the analysis for the period of 1972-2007. The data of the Gini coefficient have been taken from the Economic Survey (1990-91, 2001-02, 2008-09), where as the data of the other variables included in the analysis have been taken from the World Development Indicators (WDI) (2008) of the World Bank.

First of all we have estimated correlation matrix and descriptive statistics. Since the time series data is used in this study so we have applied Augmented Dickey-Fuller (ADF) unit root test check the stationarity of each time series. After finding all the variables to be stationary at their first difference, Johansen's cointegration test is applied.

Results and Discussions

Correlation Matrix and Descriptive Statistics

The analysis estimates the correlation matrix and descriptive statistics. The estimates are given in Table 4. The correlation statistics showed a negative and moderate correlation between Gini coefficient and agriculture value added. Where as, services value added and FDI are positively and moderately correlated with Gini coefficient, but exports of goods and services is positively and weakly correlated with the Gini coefficient.

	GINI	AVGDP	SVGDP	EGSGDP	FDI
GINI	1.00				
AVGDP	-0.61	1.00			
SVGDP	0.65	-0.96	1.00		
EGSGDP	0.27	-0.62	0.59	1.00	
FDI	0.42	-0.76	0.68	0.45	1.00
Mean	0.38	27.54	48.51	13.76	0.73
Median	0.39	26.83	49.09	13.78	0.50
Maximum	0.42	36.47	53.66	17.36	3.73
Minimum	0.34	19.39	41.91	9.24	-0.06
Std. Dev.	0.02	4.16	3.8	2.45	0.83
Skewness	0.12	0.22	-0.48	-0.27	2.36
Kurtosis	1.69	2.76	2.53	1.83	8.57
Jarque-Bera	2.67	0.37	1.69	2.51	79.93
Probability	0.26	0.83	0.43	0.28	0.00
Observations	36	36	36	36	36

Source: Author's Estimations

The descriptive statistics show that Gini coefficient increased from its minimum value of 0.34 in 1972 to its maximum value at 0.42 in 2002. Gini Coefficient has been most consistent about its mean with the lowest standard

² Engle and Granger (1987) procedure is applied on two variable model

³ Enders (2004) discusses Johansen's cointegration procedure in detail

Table 5: Results of ADF Unit Root Test

Variables	Level of Integration		ADF Statistic	5% Critical Value
LGINI	Level	Intercept	-2.09	-2.95
		Intercept and Trend	-2.66	-3.55
		None	-0.73	-1.95
	1st Difference	Intercept	-4.94*	-2.95
LAVGDP	level	Intercept	-0.51	-2.95
		Intercept and Trend	-2.23	-3.55
		None	-3.35	-1.95
	1st Difference	Intercept	-4.82*	-2.95
LSVGDP	Level	Intercept	-1.89	-2.95
		Intercept and Trend	-3.37	-3.55
		None	2.00	-1.95
	1st Difference	Intercept	-5.31*	-2.95
LESGDP	Level	Intercept	-1.55	-2.95
		Intercept and Trend	-2.58	-3.55
		None	-0.05	-1.95
	1st Difference	Intercept	-4.79*	-2.95
LFDI	Level	Intercept	-0.42	-2.96
		Intercept and Trend	-2.54	-3.56
		None	-1.26	-1.95
	1st Difference	Intercept	-5.06*	-2.96

* Significant 5% level of significance

Source: Author

deviation 0.02. Agriculture value added as percentage of GDP and service sector value added declined from its highest value 36.47 percent and 41.91 percent in 1972, respectively, to its minimum value of 19.39 percent in 2006 and 53.96 percent in 2007 respectively.

Exports of goods and services and FDI stood at maximum value of 9.94 percent in 1978 and -0.06 percent in 1973 respectively. Exports of goods and services and FDI increased to the maximum values of 17.36 percent in 1992 and 3.73 percent in 2007. Jarque-Bera statistic is also calculated to check whether the series are normally distributed. The null hypothesis of normal distribution for the agriculture value added, service value added, and exports of goods and services could not be rejected but for the FDI at 1 percent significance level.

The Unit Root Test

In this study ADF test has been applied to check the order of integration. The results of the ADF test are displayed in Table 5.

We have estimated the ADF statistic at level, without drift, with drift and with trend. We have also calculated the ADF statistic at the first difference of each time series. The results of the ADF statistics show that each time series is non-stationary at level. The ADF statistic confirms that each time series is stationary at its first difference at chosen level of significance of 1 percent and 5 percent, that is, each time series is integrated of order one.

Johansen's Cointegration Test

The time series integrated of the same order are cointegrated, that is, there exists a long run or equilibrium relationship between the time series. We have used Johansen's cointegration technique on the assumption of no deterministic trend in the data. Table 6 shows the results of Johansen's cointegration test.

In the Johansen's cointegration test, first of all, we selected the lag length for cointegration based on the Akaike and

Shwarz Information Criteria by using vector autoregressive test. The appropriate lag length is 3. We have used Maximum Likelihood Ratio (MLR) that is based on the Eigen values of the stochastic matrix of the Johansen (1991) procedure. The MLR is used to reject the null hypotheses of no cointegrating vector against at most one, at most one against 2 cointegrating vectors, and at most 2 against 3 cointegrating vectors. The MLR statistic indicates 3 cointegrating equations at 1 percent and 5 percent significance levels.

Table 6: Results of Johansen's Cointegration Test

Null Hypothesis	Likelihood Ratio	5% Critical Value	1% Critical Value	Eigen value
None**	210.49	76.07	84.45	0.97
At most 1**	100.55	53.12	60.16	0.80
At most 2**	52.24	34.91	41.07	0.69
At most 3	17.14	19.96	24.6	0.35
At most 4	4.44	9.24	12.97	0.14

Note: 1. (***) denotes rejection of null hypothesis at 5 % (1%) significance level.
2. L.R. Test indicates 3 cointegration equations at 5% significance level.

Source: Author

Long Term Determinants of Income Inequality in Pakistan

Since all the time series included in the study are I(0) at there first difference so there exists a long run relationship between the variables. The results of the long run determinants of income inequality in Pakistan, for the period 1972-2007, are given in Table 7. Since the in the Johansen's cointegrating equation dependant and independent variables all are on the same side of the equation [Johnston and Dinardo (1997)], thus we explain the estimated elasticities with the reversed signs.

Agriculture value added elasticity of Gini coefficient is -0.96 and it is significant at 1 percent and 5 percent level of significance. This strong and significant elasticity shows that

agriculture value added has a strong and negative effect on Gini coefficient. This implies that one percent increase in agriculture value added decreases the Gini coefficient by 96 percent, that is, growth in agriculture sector helps to reduce income inequality in Pakistan in long run. The results of the study are consistent with that of Mehrgan and Nassabian (2010).

Dependant Variable: LGINI			
Variables	Coefficients	Standard Errors	t-Statistics
C	-2.67*	-0.52	5.18
LAVGDP	0.96*	-0.06	-16.81
LSVGDP	-0.10	-0.09	1.8
LESGDP	0.33*	-0.02	-16.68
LFDI	0.03*	-0.01	-5.07
* significant at 5%(1%) level of significance			
Source: Author			

Agriculture sector, in Pakistan, has been the backbone of the economy as it employs 43.61 percent of the work force. Furthermore it employs 59.90 percent and 6.52 percent of the labor force of rural and urban areas respectively, [Economics Survey, 2007-08]. The growth in major crops increases the income of the people. The livestock is highly labor intensive and employment generating sector of Pakistan economy further more it is the second largest sub-sector that contributes to agriculture GDP.

Services value added elasticity of Gini coefficient show that increase in the service sector value added increases the income inequality in Pakistan over a longer period of time but this result is insignificant. This positive impact of services sector may be due to the fact that services sector is urban based and employs relatively more skilled labor. This sector constitutes more than half of the GDP but it employs only 14.43 percent of the labor force of Pakistan economy.

The elasticity of exports of goods and services and FDI are 0.33 and 0.03 respectively. These elasticities are also significant at 1 percent and 5 percent level of risk. The exports of goods and services and FDI affect Gini coefficient negatively and significantly. The negative impact of exports of goods and services may be due to the fact that Pakistan's exports comprise of labor intensive food items, textile products, products of Small and Medium Enterprises (SMEs) like sports goods, cutlery, leather tannes and manufactures, jewellery, etc.

The negative impact of FDI on income inequality is due to. Our results are in strong consistence of Hussain et al. (2005). The inflows of FDI in Pakistan generated output and increased employment opportunities. The import of modern technology and spillovers effects exert positive impact in the economy. The results of this study are in contrast to conclusions of Shahbaz and Aamir (2008). The authors are of the view that the inflow of FDI into capital intensive urban based industrial and service sectors causes increase in income inequality.

Short Run Analysis of the Determinants of Income Inequality

ECM based on the identified equilibrium relationship is used to capture the short run impacts of the explanatory variables on income inequality. The estimates of the ECM are displayed in Table 8.

The results of ECM show that income inequality in Pakistan is negatively affected by FDI agriculture valued added in the short run. The results are insignificant except FDI of last

year at 5 percent level of significance. Income inequality in Pakistan is affected positively by last one, two and three year values of Gini coefficient and service sector value added as percentage of GDP but the results are insignificant. Exports of goods and services of last year significantly and positively affect income inequality in Pakistan. Two and three year lagged values of agriculture value added cause an increase in income inequality but these results are insignificant.

The speed of adjustment is -0.92 shows that high speed of adjust after a shock to long run equilibrium and adjustment of 92 percentage points takes place each year toward long run equilibrium. The model is a good fit as the goodness of fit adjudged by R-squared is 0.66.

Variable	Coefficients	Standard Errors	t-Value
LESGDP(-1)	0.37*	-0.09	-4.13
LFDI(-1)	-0.13*	-0.03	-4.56
D(LGINI(-1))	0.20	-0.43	-0.47
D(LGINI(-2))	0.32	-0.39	-0.83
D(LGINI(-3))	0.19	-0.27	-0.71
D(LAVGDP(-1))	-0.22	-0.73	-0.31
D(LAVGDP(-2))	-0.14	-0.59	-0.24
D(LAVGDP(-3))	0.85	-0.52	-1.64
D(LSVGDP(-1))	0.74	-0.92	-0.81
D(LSVGDP(-2))	0.20	-0.81	-0.25
D(LSVGDP(-3))	2.46*	-1.20	-2.05
D(LESGDP(-1))	-0.15	-0.16	-0.94
D(LESGDP(-2))	0.15	-0.14	-1.08
D(LESGDP(-3))	0.01	-0.16	-0.02
D(LFDI(-1))	-0.08	-0.05	-1.57
D(LFDI(-2))	-0.01	-0.04	-0.40
D(LFDI(-3))	-0.03	-0.03	-1.11
Speed of Adjustment	-0.92*	-0.44	-2.11
R-squared	0.66		
Adj. R-squared	0.097		
F-statistic	1.172		
Log likelihood	62.19		
Akaike AIC	-2.88		
Schwarz SC	-1.99		
*significant at 0.05 level			
Source: Author			

Conclusion

In this study the impacts of agriculture value added, service sector value added, exports of goods and services and FDI as percentage of GDP on income inequality has been analyzed. Agriculture value added improves the distribution of income in Pakistan. The results of the study demand a robust agriculture policy focused on the development of agriculture infrastructure, diversification, adaptation of modern technology in agriculture, promotion of horticulture. Since the major crops are one of the major shares of agricultural income in rural areas there is a need to overcome the problem of water shortage in Pakistan. The construction of large and small water reservoirs would help to fulfill water shortage and it would also help to manage the energy crises in the country.

The results of the study reveal that FDI improves the distribution of income in Pakistan. There is dire need to redefine the macroeconomic policy to attract the inflows of

FDI towards the labor intensive SME sector and agro-industrial sector. This would help to diversify exports of goods and services and help to improve the value addition of the products to be exported. The negative impact of service sector value added on income inequality reveal that the focus should be to improve the human capital situation in Pakistan. The training of unskilled labor and technical education would help to grow the service sector and this sector would employ more semi-skilled and skilled labor. The focus of the government must be to overcome the energy crises and abolition of corruption.

The economy with developed infrastructure, more educated and technically equipped labor force, absence of corruption and solution of energy crises, more diversified exportables and search of new markets for these exports would help to create a better economic environment for employment generation, poverty reduction and equal distribution of income.

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