

# ESTIMATING GROSS PROVINCIAL ACCOUNTS OF SINDH\*

Muhammad Farooq Arby  
State Bank of Pakistan, Karachi  
Muhammad Ajaz Rasheed  
Economics Department  
Institute of Business Management, Karachi

## Abstract

The provincial income and product accounts are very important in the context of policy-making and planning at the provincial level. Their availability may be useful for assessing provincial growth patterns, the contribution of provinces to national output and regional income disparities. Furthermore, they may be used for allocation of available resources to decrease regional disparities. Despite its importance, no official estimate of provincial income and product accounts are available for Sindh, in particular, and for other provinces, in general. Some unofficial attempts to estimate provincial gross provincial product have been made by Arby (2008), Bengali and Sadaqat (2005) and Bengaliwala (1995) by decomposing gross domestic product of Pakistan into four provincial shares. However, these studies were one-time attempts and there is no mechanism or commonly agreed methodology to update the annual estimates of gross provincial product.

This paper updates the gross provincial product of Sindh up to fiscal year 2007-08 based on Arby's (2008) methodology. The results show that Sindh's share in Pakistan's gross domestic product, which was declining during the 1990s, is

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now rising and has reached the previous peak level of 31.9% by 2007-08. The research estimates the extent of Sindh's integration with the national economy. Our results show that if the growth rate in Pakistan minus Sindh GPP is raised by 1 percent, this increases the growth rate in Sindh's GPP by 0.91 percent. The growth in the NWFP's GP causes growth in Sindh GPP. The growth of trade and population transfer between Sindh and NWFP is clearly beneficial to Sindh. Our results show a strong association between growth of Sindh GPP and the growth of GDP of the rest of Pakistan.

JEL Classification: E01

## 2.1 Growth and structure of Sindh's Gross Provincial Product

In a developing country like Pakistan the need for estimating provincial income and product accounts can hardly be overemphasized. Availability of provincial accounts is necessary for assessing provincial growth patterns, the contribution of provinces to national output and regional income disparities. Such accounts can also be very useful as data inputs for economic research, particularly in case of cross-sectional and panel studies.

In the case of Sindh, no official estimates of provincial income and product accounts are available. Some unofficial attempts to estimate provincial gross product have been made by individuals; Arby (2008), Bengali and Sadaqat (2005) and Bengaliwala (1995) have decomposed domestic product of Pakistan into that of the four provinces. However, these studies were one-time attempts and there is no arrangement to update annual estimates of gross provincial product in Sindh.

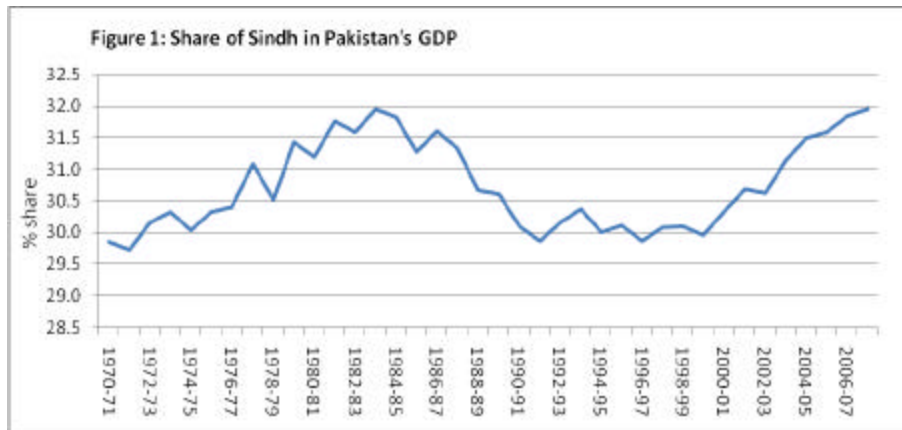
In this chapter, we have updated gross provincial product of Sindh up to fiscal year 2007-08 based on the methodology used by Arby (2008). We propose to further improve this methodology to estimate provincial accounts of Sindh provided resources are made available.

In the remaining part of this section, we present an overview of trends in Sindh's GDP and its sectoral composition. Section II describes in detail our methodology and data sources while section III estimates the extent of Sindh's integration with the national economy.

It may be noted that the estimates given in this chapter are necessarily tentative, conjectural and subject to revision as primary data on different sectors of Sindh's economy becomes available.

The overall GDP of Sindh at constant (base year 1999-2000) and current prices have been reported in Table 2.1 and Table 2.2. Data for years 1970-71 to 2004-05 have been obtained from the original study of Arby (2008); for subsequent years, data has been

extrapolated. The results show that Sindh’s share in Pakistan’s gross domestic product stood at about 30% in 1970-71 which peaked at 31.9% in 1983-84 and started to declining in subsequent years (see Figure 1). After minor decline during the 1990s, Sindh’s share in overall GDP is now shown as rising and reached the previous peak level of 31.9% in 2007-08.



In terms of growth rate during the period as a whole, Sindh’s GPP followed almost the same path as of Pakistan’s GDP (see Figure 2). However, during the current decade, Sindh’s economy has grown faster in real terms than that of Pakistan; it showed an average growth of 6.6% during 2000-08 compared to 5.8% average growth for Pakistan’s GDP.

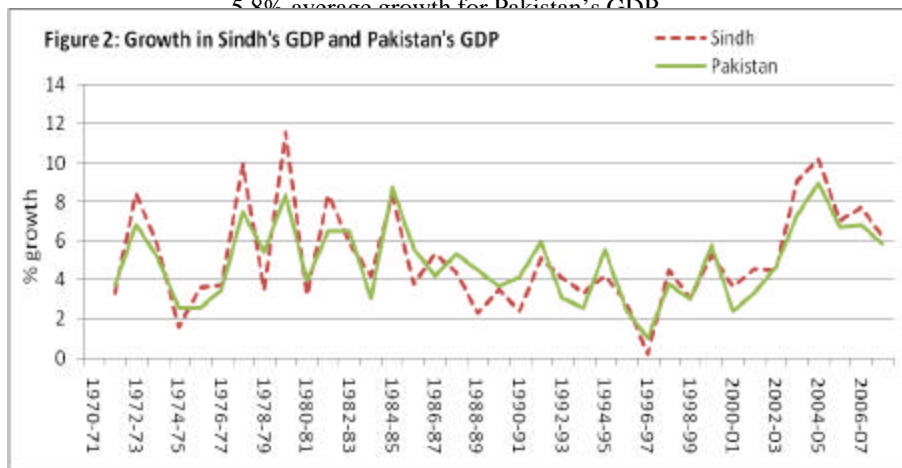


Table 2.1 : Gross Provincial Product Sindh 1970-71 to 2007-08

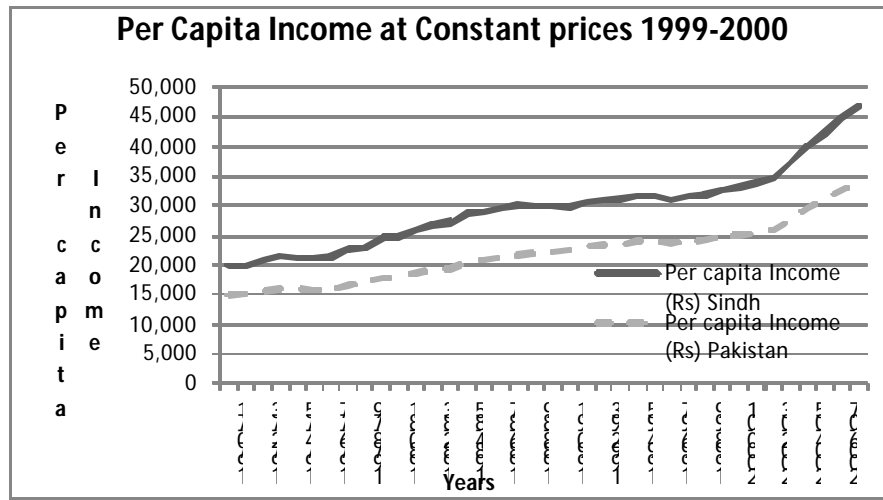
Year	GDP and GPP Constant prices 1999-2000 (Rs. In Millions)		Population (Millions)		Per capita Income (Rs)	
	Sindh	Pakistan	Sindh	Pakistan	Sindh	Pakistan
1970-71	282,250	945,992	14.18	63.42	19,912	14,917
1971-72	291,563	981,286	14.61	65.31	19,952	15,025
1972-73	316,054	1,048,217	15.07	67.26	20,979	15,585
1973-74	334,191	1,101,984	15.53	69.26	21,517	15,910
1974-75	339,321	1,130,304	16.01	71.33	21,192	15,846
1975-76	351,614	1,159,436	16.51	73.46	21,301	15,784
1976-77	364,755	1,199,828	17.02	75.65	21,435	15,860
1977-78	400,909	1,289,724	17.54	77.91	22,852	16,555
1978-79	414,976	1,359,664	18.09	80.23	22,945	16,947
1979-80	463,029	1,473,236	18.65	82.62	24,834	17,830
1980-81	477,983	1,532,420	19.22	85.09	24,867	18,009
1981-82	518,106	1,631,293	19.79	87.51	26,181	18,642
1982-83	548,648	1,736,742	20.37	89.99	26,930	19,298
1983-84	571,785	1,789,998	20.97	92.55	27,262	19,340
1984-85	619,460	1,946,721	21.59	95.18	28,688	20,452
1985-86	642,638	2,055,440	22.23	97.89	28,908	20,998
1986-87	676,999	2,142,073	22.89	100.67	29,581	21,278
1987-88	706,595	2,255,461	23.56	103.53	29,990	21,786
1988-89	722,802	2,357,024	24.26	106.47	29,798	22,137
1989-90	747,907	2,443,904	24.97	109.50	29,949	22,319
1990-91	765,828	2,545,054	25.71	112.61	29,788	22,601
1991-92	804,746	2,695,718	26.41	115.54	30,476	23,331
1992-93	837,563	2,778,407	27.11	118.50	30,894	23,446
1993-94	865,348	2,848,712	27.82	121.48	31,103	23,450
1994-95	901,999	3,006,727	28.54	124.49	31,603	24,152
1995-96	927,461	3,080,492	29.27	127.51	31,691	24,159
1996-97	929,015	3,111,582	30.00	130.56	30,970	23,833
1997-98	970,915	3,228,622	30.70	133.48	31,625	24,188
1998-99	1,000,664	3,325,913	31.47	136.69	31,795	24,332
1999-00	1,053,164	3,516,973	32.21	139.76	32,692	25,164
2000-01	1,091,807	3,600,378	32.96	142.86	33,121	25,202
2001-02	1,141,676	3,720,350	33.72	145.96	33,861	25,489
2002-03	1,192,634	3,893,462	34.46	149.03	34,607	26,125
2003-04	1,301,298	4,179,058	34.83	150.47	37,358	27,773
2004-05	1,434,095	4,553,747	35.68	153.96	40,193	29,577
2005-06	1,534,652	4,860,000	36.37	156.77	42,195	31,001
2006-07	1,652,592	5,192,000	36.94	159.06	44,735	32,642
2007-08	1,754,792	5,493,000	37.63	161.86	46,630	33,937

Source : Arby's estimates (1971-2005) and Rasheed's estimates (2006-2008).

Table 2.2 Gross Provincial Product Sindh 1970-71 to 2007-08 at current prices

Year	GDP and GPP at current prices (Rs. Millions)		Per Capita Income (Rs.)	
	Sindh	Pakistan	Sindh	Pakistan
1970-71	19,095	63,998	1,347	1,009
1971-72	20,927	70,432	1,432	1,078
1972-73	26,283	87,169	1,745	1,296
1973-74	34,446	113,586	2,218	1,640
1974-75	42,756	142,423	2,670	1,997
1975-76	49,659	163,749	3,008	2,229
1976-77	57,005	187,514	3,350	2,479
1977-78	68,284	219,670	3,892	2,820
1978-79	74,579	244,358	4,124	3,046
1979-80	91,948	292,553	4,931	3,541
1980-81	105,183	337,218	5,472	3,963
1981-82	124,695	392,612	6,301	4,487
1982-83	139,012	440,042	6,823	4,890
1983-84	158,866	497,338	7,574	5,374
1984-85	179,910	565,386	8,332	5,940
1985-86	192,793	616,637	8,673	6,299
1986-87	212,278	671,663	9,275	6,672
1987-88	242,860	775,214	10,308	7,488
1988-89	269,760	879,676	11,121	8,262
1989-90	297,135	970,936	11,899	8,867
1990-91	344,010	1,143,239	13,381	10,152
1991-92	397,902	1,332,880	15,069	11,536
1992-93	450,031	1,492,867	16,599	12,598
1993-94	525,782	1,730,867	18,898	14,248
1994-95	629,214	2,097,424	22,045	16,848
1995-96	690,815	2,294,490	23,605	17,995
1996-97	793,209	2,656,721	26,443	20,349
1997-98	883,231	2,937,042	28,769	22,004
1998-99	963,582	3,202,663	30,616	23,430
1999-00	1,053,164	3,516,973	32,692	25,164
2000-01	1,179,370	3,889,128	35,777	27,223
2001-02	1,263,949	4,118,799	37,488	28,219
2002-03	1,378,804	4,501,231	40,009	30,204
2003-04	1,620,767	5,205,017	46,529	34,592
2004-05	1,911,649	6,070,145	53,578	39,427
2005-06	2,260,236	7,157,808	62,145	45,658
2006-07	2,628,117	8,256,838	71,143	51,910
2007-08	3,164,766	9,906,626	84,097	61,205

Source : Arby's estimates (1971-2005) and Rasheed's estimates (2006-2008).



At constant 1999-2000 prices Sindh’s gross provincial product per capita measured at factor cost rose from Rs. 33,692 in 1999-2000 to Rs. 46,630 in 2007-08, while the corresponding figure for Pakistan was Rs. 25,164 and Rs. 33,937 respectively. In 2007-08, Sindh’s per capita income exceeded national per capita income in real terms by 28 percent by 34 percent in 2007-2008. During the period 2000-2008, per capita income grew faster in Sindh than on average in the other three provinces of Pakistan.

In the beginning of the 1950s, Sindh was estimated to have a per capita income about 56 percent higher than the average per capita income of Pakistan’s other provinces (including East Pakistan). In 1990-91, this had declined to about one third. We have seen that by 1999-2000, the excess of Sindh’s per capita income over that of the rest of Pakistan (on average) had fallen further to about 28 percent. The World Bank claims that in 2004-2005 the excess of Sindh’s per capita over average per capita income of Pakistan had fallen to just 16 percent and that during 1994-95 to 2004-05 per capita income in Sindh grew at an annual average rate of only about 0.9 percent (as against about 2.1 percent for Pakistan as a whole). According to Arby’s estimates,

<sup>1</sup> Khalid Ikram; "Economic Development View from the provinces", Center for Research for Economics and Business, Lahore School of Economics, Lahore 2009

however, per capita income (estimated at constant factor cost of 1999-2000) grew at an annual average rate of over 2 percent per annum in Sindh during this period. The difference between the two studies may be due to the fact that while Arby's estimates are based on 1999-2000 prices, World Bank estimates were based on 1980-81 prices.

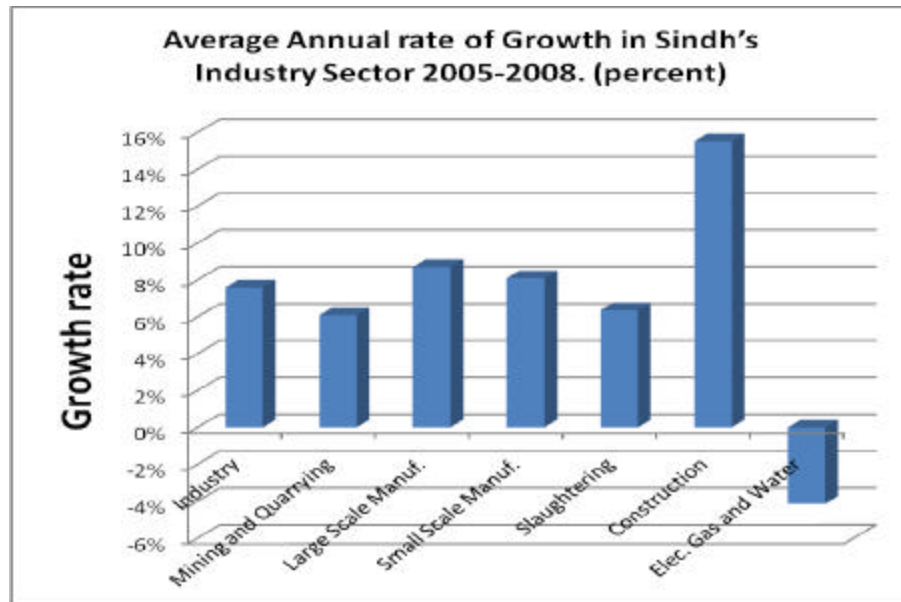
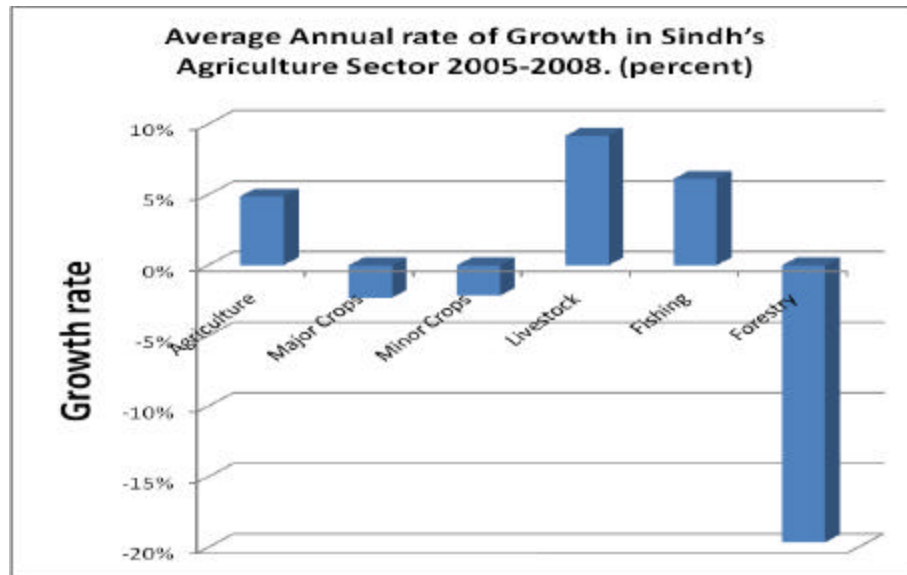
Average per capita GPP figures conceal the distribution of income pattern. In Sindh inter regional inequalities are most acute. Over two thirds of Sindh's urban population resides in Karachi, where manufacturing and services sector employment is heavily concentrated. According to the labor force survey for 2003-2004, 66 percent of Sindh's labour force was employed in the service sector and 32 percent in industry. As against this, only 21 percent of Sindh's rural labor force worked in the services sector and just 9 percent in industry. Over 70 percent of the rural population of the province worked in agriculture. Mean per capita consumption in rural Sindh is only half that of urban Sindh; and the quality of life in Karachi is far better than the rest of Sindh. Developing a strategy for integrating Karachi within the provincial economy should thus be a high policy priority of the provincial government. Initiatives in this respect should be the key means for dealing with poverty, deprivation and mal-distribution of assets and income in Sindh.

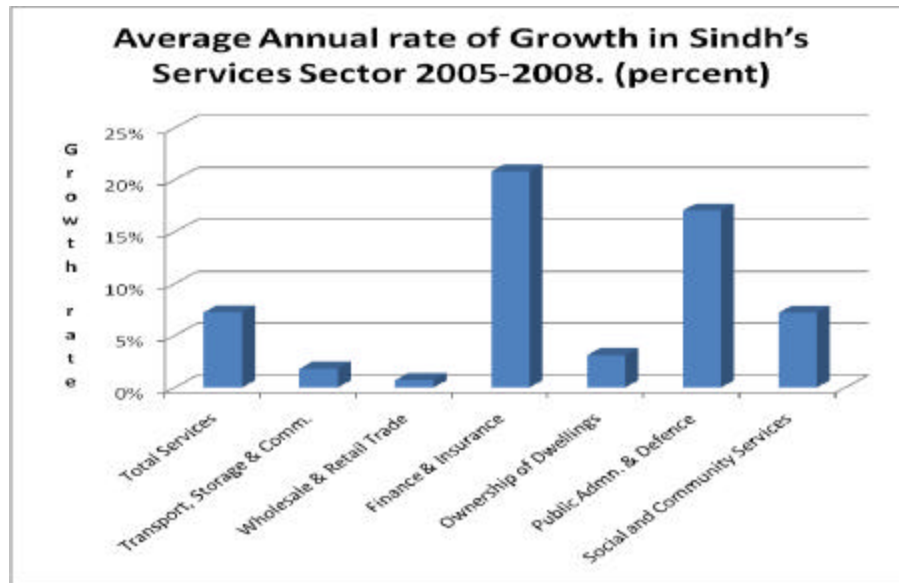
Table 2.3 presents average sectoral growth rates during 2005-2008. These figures show a considerable diversity in the growth experience of Sindh. It appears that agriculture's growth was primarily due to the extra ordinary growth of the livestock sector in 2006 when it recorded a value added growth rate of 19.8 percent. However, both major and minor crops experienced negative average growth during 2005-2008. The growth of fishing was impressive. There has been massive deforestation in Sindh during this period and forest sector output and value added has declined drastically. This is an ominous sign and can lead to a major environmental crisis in the not too distant future.

**Table 2.3:**

<b>Average Annual rates of Growth in Sindh's Main Economic Sectors 2005-2008. (percent)</b>	
<b>Agriculture</b>	4.89%
Major Crops	-2.30%
Minor Crops	-2.15%
Livestock	9.18%
Fishing	6.13%
Forestry	-19.64%
<b>Industry</b>	7.60%
Mining and Quarrying	6.09%
Large Scale Manuf.	8.69%
Small Scale Manuf.	8.10%
Slaughtering	6.37%
Construction	15.53%
Elec. Gas and Water	-4.13%
<b>Services</b>	7.22%
Transport, Storage & Comm.	1.81%
Wholesale & Retail Trade	0.69%
Finance & Insurance	20.82%
Ownership of Dwellings	3.11%
Public Admn. & Defence	17.04%
Social and Community Services	7.18%
<b>Gross Provincial Product</b>	6.96%

Source: Rasheed's estimates.





The industrial sector growth was high, particularly construction and large scale manufacturing. On the other hand, growth in water, electricity and gas was negative during 2005-2008. Power available in Sindh in 2008 was lower than at the beginning of the period. Overburdened infrastructure is already emerging as a major constraint on development in the province.

The healthy growth of the public service sector was due to unusually high growth in finance and public administration and defense services in Sindh. On the other hand, growth in transport, communication, storage and ownership of dwelling was unsatisfactory reflecting both inadequate development of infrastructure and income inequality despite a 15.6% growth in construction; value added for Ownership of dwelling grew modestly during 2005-2008. The near zero rate of growth in wholesale and retail trade and in transportation, storage and communication also reflects the under development and weakness of physical infrastructure in Sindh.

Table 2.4 presents changes in the structure of gross provincial product in Sindh during 1982-2008. The period is characterized by a continuing declining in the share of agriculture in GPP from 23.7 percent in 1982 to 15.4 percent in 2008. Decline in agriculture's GPP share was least during 1992-2002 but has accelerated during 2002-2008.

**Table 2.4 Structure of GPP in Sindh 1982-2008**

Year	1982	1992	2002	2008
<b>GDP f.c (Sindh)</b>	100	100	100	100
<b>Agriculture</b>	24	19	18	15
<b>Major Crops</b>	10	7	4	3
<b>Minor Crops</b>	5	3	2	2
<b>Livestock</b>	8	9	11	10
<b>Fishing</b>	1	1	1	1
<b>Forestry</b>	0	0	0	0
<b>Industry</b>	29	30	27	30
<b>Mining and Quarrying</b>	2	3	2	2
<b>Large Scale Manuf.</b>	21	17	15	19
<b>Small Scale Manuf.</b>	2	2	3	3
<b>Slaughtering</b>	1	2	2	2
<b>Construction</b>	2	2	2	2
<b>Elec. Gas and Water</b>	2	3	2	2
<b>Services</b>	47	51	54	54
<b>Transport, Storage &amp; Comm.</b>	8	10	11	9
<b>Wholesale &amp; Retail Trade</b>	20	19	18	16
<b>Finance &amp; Insurance</b>	7	9	7	12
<b>Ownership of Dwellings</b>	2	3	3	3
<b>Public Admn. &amp; Defence</b>	4	5	7	7
<b>Social and Community Services</b>	5	5	8	7

Source : Arby's estimates (1982-2002) Rasheed's estimates (2008)



Currently value added in agriculture is dominated by the livestock sub sector, which in 2002 and 2008 accounted for about two thirds of agricultural sector value added. The share of major crops in agriculture has continued to decline i.e. from about 25 percent in 2002 to about 20 percent in 2008. The share of minor crops has declined even more drastically and forestry has virtually disappeared as a source of contribution to agriculture. The dominance of agriculture by the livestock sector is in sharp contrast to the Punjab where major and minor crops dominate the sector. Share of Industry in GPP remained largely unchanged during 1982-2008 – at about 29 percent. Industry was dominated by large scale manufacturing which increased its share of industrial sector from 56.5 percent in 2002 to 61.2 percent in 2008. The mining sector's share is modest and there has been a significant decline during from 8.9 percent in 2002 to 6.9 percent in 2008. Sindh's considerable mineral resources need to be developed.

The share of the services sector in Sindh's GPP has increased from 50.8 percent in 1992 to 54.1 percent in 2008. There was significant structural transformation within the services sector during 2002-2008. The share of transport, storage &

communications declined over time while that of finance and insurance and public administration and defence increased.

Overall structural transformation during the previous three decades has been modest. The services sector orientation of the Sindh economy has increased and industry's share of GPP has been stagnant. The most significant change is the major drop in the GPP share of value added generated within the crop sub sectors. This has fallen from about 16 percent in 1982 to less than 5 percent in 2008. Crop production's relative decline should be a cause of concern to the government of Sindh

## **2.2 Estimation methodology**

### **2.2.1 Methodology of estimating Sindh Provincial Accounts 1971-2005**

The methodology for estimating provincial value added is derived from Farooq Arby's thesis.<sup>2</sup> In this sub-section we describe the methodology for estimating value added for agriculture, manufacturing and service sectors on the basis of provincial production statistics with 1999-2000 as the base year.

#### **2.2.1.1 Agriculture**

##### **2.2.1.1.1 Crops**

By applying 1999-2000 prices as base prices on the quantity of the provincial output of the 12 major crops (wheat, cotton, sugarcane, rice, jowar, bajra, gram, sesamum, barley, maize, tobacco, rapeseed & mustard) we obtain production value at constant prices.

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<sup>2</sup> Arby, M. F. (2008), "Some Issues in The National Income Accounts of Pakistan (Rebasing, Quarterly and Provincial Accounts and Growth Accounting), Pakistan Institute of Development Economics, Islamabad, Pakistan

Output value of major crops at constant prices of 1999-00 is given by.

$$Y_t = \sum_{j=1}^{12} (P_{j0} \cdot Q_{jt}) + \sum_{j=1}^{12} (\bar{P}_{j0} \cdot b_j Q_{jt}) \quad (2.1)$$

$Y_t$  = gross output value of major crops in year  $t$

$Q_{jt}$  = physical output of crop  $j$  in year  $t$

$P_{j0}$  = base year (1999-00) price of crop  $j$

$\bar{P}_{j0}$  = base year (1999-00) price of by-product of crop  $j$

$b_j$  = ratio of by-product to principal crop  $j$

The physical output of each crop has been taken from various issues of Agricultural Statistics of Pakistan and base year prices have been taken from the Rebasing book published by FBS (FBS, 2004)<sup>3</sup>. The ratios of by-products to principal crops have also been reported in the Rebasing book. In order to work out value added, the input cost valued at 1999-00 prices is required. The technique used by Arby (2008) is employed for estimating the series of input values. The value added of major crops was obtained by subtracting input values from output value of the crops. A similar methodology is applied for minor crops.

Value added of crops at current prices has been worked out by applying relevant crop price deflators on their value added estimates at constant prices (as done by FBS).

#### 2.2.1.1.2. Livestock

In the current FBS methodology, natural growth and net sales of animals have been included for the first time in the livestock sector, while slaughtering which was earlier included under livestock has now been moved to the manufacturing sector. Thus, the new estimates of gross value added in the livestock sub-sector include the following items:

##### 1. Natural growth of animals

<sup>3</sup> National Accounts of Pakistan - Rebasing From 1980-81 to 1999-2000, Government of Pakistan, Statistics Division, Federal Bureau of Statistics.

2. Net sales
3. Milk production
4. Draught power
5. Dung & urine
6. Wool & hair
7. Poultry

The methodology used for estimating the gross output value under these heads is discussed below. The methodology used for estimating the gross output value under these heads is discussed below:

#### 1. Natural Growth:

Natural growth of animal stock has been worked out by multiplying the base year prices of animal categories to the number of animals below one year of age. The animals included are cattle, buffaloes, sheep, goats, camels, horses, asses and mules. The base year prices were obtained from the Rebasing book and the population of animals has been obtained from four livestock censuses of 1972, 1976, 1986 and 1996; the census figures for inter-census years have been interpolated. Figures for the 1996-2005 period have been estimated.

#### 2. Net Sales:

The gross value of net sales has been worked out as the product of the base year prices of adult animals and number of animals sold for slaughtering. The number of animals sold for slaughtering in a year (t) has been estimated as follows:

$$S_{it} = L_{it-1} + N_{it} - L_{it} \quad (2.2)$$

$S_{it}$  = number of slaughtered animals of kind i in year t

$L_{it}$  = total number of animals of kind i in year t

$N_{it}$  = number of new born animals of kind i in year t.

Animals included in the estimates of net sales are cattle, buffaloes, sheep, goats and camels. The base year prices for these animals were taken from the Rebasing Book.

### 3. Milk Production:

The total value of milk production has been estimated according to the technique used by FBS. The gross output of milk used for national accounts estimations is that part of milk production which is used for human consumption. A formal representation of this technique is given below:

$$Y_t = \sum_i u_i P_{ui}^0 C_{it} + (1-u_i) \bullet P_{ri}^0 C_{it} \quad (2.3a)$$

$$C_{it} = c_i \cdot m_i \cdot M_{it} \quad (2.3b)$$

$Y_t$  = gross output of milk

$u_i$  = share of urban areas in total consumption of animal milk

$1 - u_i$  is that of rural areas

$P_{ui}^0$  = base year price of animal milk  $i$  in urban areas

$P_{ri}^0$  = base year price of animal milk  $i$  in rural areas

$C_{it}$  = Total consumption of animal milk  $i$ .

$c_i$  = ratio of milk consumption to production from  $i$ th animal

$m_i$  = production of milk per animal  $i$

$M_{it}$  = number of milch animal  $i$  in year  $t$

$i$  stands for kind of milk animal, i.e., cow, buffalo, sheep, goat and camel.

### 4. Draught Power, Dung, hair and wool

The output value of draught power is based on the number of draught animals in a given year and assumed contribution of an animal to ploughing. We have used the technique for estimating draught power used by FBS<sup>4</sup>. Estimation of value added of dung, urine, and hair and wool production are also based on FBS technique<sup>5</sup>

<sup>4</sup> National Accounts of Pakistan - Rebasing From 1980-81 to 1999-2000, Annexure-22. Government of Pakistan, Statistics Division, Federal Bureau of Statistics.

<sup>5</sup> Chapter 2 and Annexure-24

### 5. Poultry

The gross output value of poultry has been estimated by splicing, i.e., projecting benchmark estimates backwards through applying growth rates of the old series. In the current FBS methodology, the value of different types of poultry products like broilers, layers, breeders, desi-poultry, etc., have been estimated separately for which past data are not available.

However, the new estimates of poultry value added at prices of 1999-00 are very close to the old estimates at the same year price which implies that there is no significant difference in the overall quantity of poultry products measured by the two methodologies. Moreover, the relative prices of different kinds of poultry products are unlikely to change significantly, so the splicing method for this case may give us reasonably accurate estimates.

The gross value added of livestock at constant prices has been estimated by deducting livestock inputs from total gross value of livestock output as estimated above. The input has been estimated by using the input-to-output ratios in the benchmark estimates. As given in the Rebasing book, the poultry input cost is 36.2% of gross output value of poultry; and for other items, the input cost is 21.2% of their output values.

The gross value added of livestock as estimated above is at constant prices of 1999-00; it has been converted into current prices by using the wholesale price index. We have applied wholesale price indices for output value of milk, eggs and chickens; and wholesale price index of meat for all other items.

### 2.2.1.1.3 Fishing

Fishing includes inland fishing and marine fishing. Its value added has been estimated by application of the following estimation formulae:

$$V_t = (2 \times Q_t \times 34.75 \times (1 - 0.16)) + (M_t \times 16.43 \times (1 - 0.36) \times (1 - 0.065)) \quad (24)$$

$V_t$  = value added of fishing at constant prices of 1999-00

$Q_t$  = quantity of inland fish caught

$M_t$  = quantity of marine fish cost

The figures of 34.75 and 16.43 are base year's prices of inland and marine fish respectively (Rupees/kg). The figure 0.16 and 0.36 are percentage of input in gross value. The figure 0.065 is auction charges for marine fishing. The quantity of inland fish is doubled in these calculations to adjust underreporting (of 100 percent)<sup>6</sup>.

Data for inland and marine fish catch have been obtained from Agricultural Statistics of Pakistan. The value added at current prices has been estimated by applying wholesale price index of fish to constant price value added data.

### 2.2.1.1.4 Forestry

Forestry output includes value added of timber, firewood and minor forest products. We have taken benchmark estimates of the three components from the Rebasing book and used their respective growth rates for estimating gross output value in past and subsequent years at 1999-00 prices. The value added has been estimated by deducting 25% of timber and firewood from gross output value (as done by FBS)<sup>7</sup>. These estimates are at constant prices and have been converted into current prices on the basis of wholesale price indices of timber and firewood.<sup>8</sup>

<sup>6</sup> Chapter 2 and Annexure-26

<sup>7</sup> Chapter 2 and Annexure-27

<sup>8</sup> For this purpose a composite index has been constructed on the basis of individual indices of timber and firewood and their respective shares in value added as weights.

### 2.2.2 Industry

The industrial sector consists of four sub-sectors comprising mining and quarrying, manufacturing, construction, and electricity, gas, and water supply. The manufacturing sector has been further divided into large-scale manufacturing, small-scale manufacturing and slaughtering. The value added of the industrial sector has been estimated using a product approach. A detailed description of each sub-sector is given below:

#### 2.2.2.1 Mining and quarrying

The current estimates of the value added of mining and quarrying at 1999-00 prices are based on three principal components; minerals, i.e., coal, natural gas and crude oil and more than thirty other minerals. The past data series on mining output are available only for 24 items (including coal, gas and crude oil) in the Statistical Year Book. The data are province-wise and constitute 88% of the current estimates of the output value of mining and quarrying. We have estimated the past series of output value of this sector on the basis of these 24 items and their respective base year prices; the value of the rest of the items has been estimated on pro rata basis. The current estimates also cover allied services and exploration (AS & E) and surface minerals like bajri, ordinary sand, etc., past information for which is not available in published sources. We have, therefore, used fixed ratios worked out from benchmark data. Value added has been estimated by deducting input costs from output; we have used the same input to output ratio as used by FBS. It may be noted that in the new estimates, input ratios are different for different types of minerals while in the old methodology, 20 percent input cost was deducted for all minerals.

The value added at constant prices of 1999-00 have been converted to current prices by using a composite wholesale price index of coal and natural gas; the index has been worked out on the basis of individual wholesale price indices of coal and natural gas and their weights.<sup>9</sup> The weights of coal ( $W_c$ ) and gas ( $W_g$ ) have been worked out as follows:

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<sup>9</sup> The wholesale price index of crude oil is not available; the indices for diesel oil, motor spirit, etc., are available but only after 2000; this is why we used coal and gas indices only.

$$W_c = \frac{S_c}{S_c + S_g} \quad (2.5a)$$

$$W_g = 1 - W_c \quad (2.5b)$$

$S_c$  and  $S_g$  are respective shares of coal and gas in total mining output.

#### 2.2.2.2 Manufacturing

In the current FBS methodology, manufacturing consists of three sub-sectors:

- i. Large-scale manufacturing
- ii. Small-scale manufacturing
- iii. Slaughtering

##### i) Large-scale manufacturing

The current estimates of value added for years 1999-00 onward have been made on the basis of the new benchmark value for the base year and new weights for different industries in quantum index of large-scale manufacturing. The weights are based on census of manufacturing industries (CMI), 2000-01. For the purpose of estimating past series, Arby (2008) has worked out a new series of the quantum index of large-scale manufacturing on the basis of industry-wise production data as reported in various issues of Monthly Statistical Bulletin of FBS. The set of weights were available for 1980-81 and 1999-00; for the period prior to 1990, 1980-81 weights have been used and for the period from 1990 onward, the new weights of 1999-00 have been used. Thus, the index number constructed has then been used in turn to estimate value added at new base by applying its growth backward on new benchmark estimates of LSM, i.e.:

$$LSM_t = \prod_{i=t}^{-1} (1 + g_{t-i})^{-1} \cdot LSM_0 \quad (2.6)$$

$LSM_0$  = benchmark estimates of value added at new base in year 1999-00  
 $LSM_t$  = value added at new base in year t (earlier than 1999-00)  
 $g_t$  = growth rate of quantum index of manufacturing (1999-00=100)  
 t ranges from -27 to -1 such that -27 is year 1970-71 and -1 is year 1998-99.

We have applied wholesale price index of manufacturing to convert constant price estimates into current price estimates.

#### ii) Small-scale manufacturing

The gross value added of small-scale manufacturing is estimated by FBS by applying different fixed growth rates on benchmark value. The past series of gross value added at new base has thus been estimated on the basis of new benchmark value and given growth rates, i.e.:

$$SSM_t = \prod_{i=t}^{-1} (1 + h_{t-i})^{-1} \cdot SSM_0 \quad (2.7)$$

$SSM_0$  = benchmark estimates of value added at new base in year 1999-00  
 $SSM_t$  = value added at new base in year t (earlier than 1999-00)  
 $h_t$  = growth rate of small-scale manufacturing  
 t ranges from -27 to -1 such that -27 is year 1970-71 and -1 is year 1998-99.

The wholesale price index of manufacturing has been used for converting the series into current prices.

#### iii) Slaughtering

The products included in slaughtering are the following:

- i. meat
- ii. animal fats
- iii. hides & skins
- iv. guts / casings
- v. bones & blood
- vi. edible offal

- vii. head & trotters
- viii. horns & hooves

The quantities of these products have been taken from Agricultural Statistics of Pakistan; the base year prices have been taken from Rebasing book. The inputs of slaughtering are net sales of animals as estimated in livestock section, poultry inputs and other inputs. For poultry inputs we have used the benchmark ratio of input-to-poultry output, and for other inputs we have used the benchmark ratio of input-to-total output. Thus the value added at constant prices of 1999-00 is estimated as follows:

$$V_t = (1-s) - \sum_i P_{j0} Q_{jt} - NS_t - r Y_{pt} \quad (2.8)$$

$V_t$  = Value added of slaughtering at constant prices of 1999-00

$P_{j0}$  = base year price of product j of slaughtering

$Q_{jt}$  = quantity of product j of slaughtering in year t

$NS_t$  = Net sales in year t at prices of 1999-00

$Y_{pt}$  = Value of poultry output in year t at prices of 1999-00

$r$  = Benchmark ratio of poultry input-to-poultry output

$s$  = Benchmark ratio of other input-to-total output

The gross value added computed as above is at constant prices of 1999-00, it has been converted to current prices values by using the wholesale price index of meat.

### 2.2.2.3 Construction

Construction value added is estimated by FBS by applying some coefficients of construction-related investment expenditures (gross fixed capital formation) in different sectors.<sup>10</sup> In the current methodology such coefficients are different from those in the old methodology. On the basis of available information, we have estimated the past data at the new base on the basis of the following three steps:

1. We worked out construction-related investment expenditure ( $\tilde{E}_{jt}$ ) by reverse-engineering from old series of construction value added ( $\tilde{V}_{jt}$ ) and old coefficients ( $\tilde{m}_j$ )
2. We used splicing method to convert construction-related investment in each sector at new base
3. Applied new coefficients ( $\mu_j$ ) on new series of construction-related investment expenditure ( $E_{jt}$ ) to estimate value added of construction on the new base ( $V_{jt}$ )

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<sup>10</sup> Investment expenditures can be divided into two groups: construction-related like erecting a building, and non-construction like installing machinery. The construction related expenditure, on the other hand, consists of payments to factors of production and purchase of intermediate goods like cement, iron rod, etc. The construction value added excludes intermediate goods from total construction-related investment expenditure. The coefficients used, which are based on different studies and experts opinion, represent the value added part of the total construction-related investment.

Formally, the construction value added at the new base has been worked out as:

$$V_t = \sum_j V_{jt} = \sum_j m_j \left( \frac{E_j}{\tilde{E}_j} \right)_{1999-00} \bullet \tilde{E}_j \quad (2.9a)$$

$$\tilde{E}_{jt} = \tilde{V}_j / \tilde{m}_j \quad (2.9b)$$

The value added of the construction sub-sector at constant prices of 1999-00 as estimated above has been converted into that at current prices by using workers' wage index following the FBS technique. The series of wage index has been derived from the old FBS series of value added of construction at current prices and constant prices; its base has been changed to 1999-00.

#### 2.2.2.4 Electricity, gas and water supply<sup>11</sup>

We have taken the benchmark value added of electricity and gas distribution at 1999-00 prices as estimated by FBS and worked out the past series using growth rates of respective series at old base.

Water supply includes canal water, tube-wells, domestic supply, and commercial and industrial supply; the growth rates of the following variables have been used to estimate the gross value added of the four heads of water supply for past years:

- canal water availability at farm gate
- number of tube-wells
- number of houses
- number of commercial and industrial establishments

<sup>11</sup> The gross value added of electricity and gas has been provincialised on the basis of provinces shares in consumption of electricity and gas; while gross value added of water supply has been provincialised on the basis of provincial shares in area irrigated by canal water, number of tubewells, number of houses and number of commercial and industrial establishments.

The growth rates of the above variables have been applied backward on benchmark estimates of canal water, tube-well, domestic and commercial water supply respectively.

The gross value added as estimated above is at 1999-00 prices which has been converted to current prices by using wholesale price index of fuel and lighting for electricity and gas and general wholesale price index for water supply.

### **2.2.3 Services**

The services sector consists of six sub-sectors comprising (i) trade, hotels and restaurants, (ii) transport, storage and communication, (iii) finance and insurance, (iv) ownership of dwelling (v) public administration and defence services, and (vi) social, community and personal services. The gross value added of almost all services is estimated by FBS through the income approach. For some services growth rates of certain indicators or some fixed growth rates are applied on benchmark estimates to get gross value added in years other than the base year.<sup>12</sup> Where possible, we have estimated gross value added on the basis of the income approach. However, in cases where necessary information is not available, we have applied growth rates of

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<sup>12</sup> For example growth in number of houses is used for ownership of dwelling; fixed growth rates are used for services like real estate, non-profit institutions serving households (NPISH), etc.

closely related variables on benchmark estimates. Details of our methodology for each of the sub-sectors are given below:

### **2.2.3.1 Trade, hotels & restaurants<sup>13</sup>**

This sector consists of value added in three types of services, viz., wholesale and retail trade of domestically produced goods, trade of imported goods, and hotel and restaurants services. Value added is estimated by applying trade margins on domestic production and imports. For the period prior to 1980-81, the benchmark margins of 1980-81 have been used; for the period beyond 1999-00, the benchmark margins of 1999-00 have been used; while for the period in-between 1980-81 and 1999-00, trade margins have been interpolated by using the two benchmark ratios.

The value added of hotels and restaurants has been estimated by using information about the hotel industry in different hotel surveys undertaken by the Tourism Division of the Federal Government. The formal description of the technique applied to generate new estimates of gross value added of wholesale and retail trade for past years is given below:

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<sup>13</sup> Trade margins and tradable surplus ratios for provinces are used as for national estimates. The trade margins for imports are applied on provincial estimates of imports to estimate import related value added of trade. Provincial estimates of imports of consumers goods is provincialised using the share of provinces in urban population, imports of capital goods is provincialised using provincial share in industry and imports of raw material is provincialised using provincial share in industry. The value added of hotels and restaurants have been provincialised on the basis of provincial shares in years of 1979, 1984, 2000 for which surveys of hotel and restaurants. The trade of commodities coming from other provinces could not be estimated due to unavailability of data series of inter-provincial commodity flows.

$$V_t = \sum_j a_{jt} \cdot b_j \cdot Y_j + (U_t)^{-1} \sum_k p_{kt} \cdot q_{kt} \cdot M_{kt} + VH_t \quad (2.10 a)$$

$$\hat{V}_t = w_t \sum_j a_{jt} \cdot b_j \cdot Y_{jt} + \sum_k p_{kt} \cdot q_{kt} \cdot M_{kt} + \hat{V}H_t \quad (2.10 b)$$

V = value added of trade at constant prices of 1999-00

$\hat{V}_t$  = value added of trade at current prices

$Y_{jt}$  = output value at 1999-00 prices of different items of domestic production

$?_{jt}$  = marketable surplus as percent of output value of domestic products

$?_{jt}$  = trade margins as percent of output value of domestic products

$?_k$  = marketable surplus as percent of import of category k<sup>14</sup>

$?_k$  = trade margins as percent of import of category k

$M_{kt}$  = import of category k in year t

$U_t$  = unit value index of imports with 1999-00 as base year

$VH_t$  = Gross value added of hotel and restaurants at constant prices

$\hat{V}H_t$  = Gross value added of hotel and restaurants at current prices

$?_t$  = wholesale price index with 1999-00 as base year

The data needed for the above calculations consists of (a) domestic production estimated on the basis of the current methodology, (b) imports and unit value index of imports which is available in FBS publications, and (c) trade margins, tradable surplus ratios and wholesale price index which are also available in FBS publications (d) gross value added of hotel and restaurants which have been estimated as described below:

There have been three surveys of the hotel industry in different years. The Tourism Division undertook two surveys on the industry, one in 1979 and the other in 1984. A third survey was undertaken in 2000 by the Ministry of Minorities, Culture, Sports,

<sup>14</sup> The imports are classified into three categories viz., imports of consumer goods, capital goods and raw material.

Tourism and Youth Affairs. These surveys reported province wise information of hotel industry about total receipts, operating surplus, establishment cost, etc. We have used this information to work out gross value added by the income approach during these years. The average growth rate of value added, adjusted for inflation, between these years (1979, 1984 and 2000) has been used to estimate the series of value addition by applying this growth on benchmark estimates of 1999-00.

### **2.2.3.2 Transport, storage & communication<sup>15</sup>**

Transport, Storage and Communications sector consists of the following services:

1. Pakistan Railways
2. Water Transport
3. Air Transport
4. Pipeline Transport
5. Road Transport
6. Communications
7. Storage

The gross value added of these services is estimated on the basis of the income approach which combines compensation to employees, depreciation and gross operating surplus. In the current FBS methodology, coverage has been extended to courier services, mobile phones, tour operators,

<sup>15</sup> Pakistan Railway is provincialised on the basis of length of railway routes in each province; air transport is undertaken on the basis of all passengers handled at airports located in each province; the gross value added of pipeline transport is distributed into provinces on the basis provincial oil consumption; water transport, 100% value added of PNSC, KPT, Port Qasim and others to Sindh; value added of boats has been allocated to the four provinces on the basis of distribution of number of boats in each province; gross value added of road transport is provincialised on the basis of number of vehicles registered in provinces; nonmechanized transport is undertaken on the basis of provincial population of camels, horses, asses and mules. The gross value added of telecommunication sector is distributed into provinces on the basis of number of telephones in each province; postal services is provincialised on the basis number of postal employees in each province; storage is undertaken on the basis of provincial gross value added of trade

travel agents, pipeline transport, etc. We have used a number of indicators to estimate the gross value added of this sub-sector in years prior to 1999-00. The current methodology covers four modes of transportation viz., railway, air, pipeline, water and road transport. We have estimated gross value added (GVA) of railway by combining surplus/deficit, staff expenses and depreciation as reported in various issues of Statistical Year Book. This approach gives us gross value added at current prices which is deflated by the consumer price index to get constant gross value added at 1999-00 prices.

The gross value added of air transport is estimated by backward application of growth in passengers (both domestic as well as international) embarked and disembarked at Pakistani airports on the new benchmark estimates of 1999-00.<sup>16</sup> The required data were obtained from various issues of annual reports of the Civil Aviation Authority.

The third mode of transport is pipeline transport. Pipeline transport activities of institutions like PARCO, Asia Petroleum Limited, etc., are included in this sub-sector. We have estimated its gross value added by backward projection of the benchmark estimates in 1999-00 on the basis of annual growth rate of oil consumption (quantity in tonnes).<sup>17</sup> The data on oil consumption were obtained from various issues of Pakistan Economic Survey.

Water transport is another important service covered in this sub sector. We have estimated past series of gross value added separately for PNSC, KPT, Port Qasim by back-application of growth rates of gross earnings of PNSC (deflated by CPI),

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<sup>16</sup> The Air transport also includes cargo transport; however, assuming a constant ratio of average cargo per passenger and a constant output-to-input ratio, we have used growth in air passenger as proxy for growth in gross value added of air transport.

<sup>17</sup> The underlying assumptions are constant input to output ratio in this service and equality of growth rates of oil transported and consumed.

cargo handled at KPT, cargo handled at Port Qasim respectively on their respective benchmark estimates.<sup>18</sup> The Pakistan Economic Survey and Statistical Year Book are sources of data required for these estimates. For boats, we have applied the growth rates of old series on new benchmark estimates.

The gross value added of the rest of the items in this mode of transport have been estimated on pro-rata basis: Let the sum of the value added of PNSC, KPT, Port Qasim, Boats be  $V1_t$  in period  $t$ ; the value added of other institutions be  $V2_t$ ; and

$q = \left( \frac{V2}{V1} \right)_{1999-00}$  in the base year (1999-00). Then  $V2_t = q \times V1_t$  for all  $t$ .

Road transport is the largest contributor to gross value added of this sector. We have used growth in the number of vehicles on the road to project the past series. The gross value added of different types of vehicles was estimated separately. The vehicles covered in this exercise are buses, trucks, wagons, pickups, delivery vans, taxis, rickshaws, NLC and non-mechanized transport. The data of vehicles on the road were obtained from various issues of Pakistan Economic Survey.

The communication sub-sector includes gross value added of PTCL, mobile phones, Pakistan Post Office, courier services, etc. Given the benchmark estimates of the contribution of PTCL in gross value added during 1999-00, we have projected it backward by using the growth in the number of telephone connections. The gross value added of mobile phones for previous years is also estimated on the basis of mobile phone connections. The data on mobile phone connections were obtained from reports of PTA for the period 1995-96 to 1997-98

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<sup>10</sup> The growth rates of gross earnings are equal to growth rates of gross value added when we take a constant output to input ratio.

and from the Pakistan Economic Survey for subsequent years. We extended the data set backward up to 1991-92 (the year when the first mobile company, Instaphone started its operations on a commercial basis) on pro rata basis. The gross value added of PTCL has been estimated by backward application of growth in telephone connections on benchmark estimates. Various issues of Statistical Year Book were the sources for the data on PTCL telephone connections.

The gross value added of Pakistan Post Office for the period 1970-71 to 2004-05 was worked out by using the income approach as done by FBS. It was estimated by adding up establishment cost, depreciation and operating surplus (deficit). The required data were obtained from various issues of annual reports of Pakistan Post Office. For courier services, we have no information except benchmark estimates of their gross value added in 1999-00 and the fact that the pioneer courier company TCS started its operation in May 1983. Using the benchmark estimate of Rs 5,797 million in 1999-00 and taking 1982-83 as the first year, we have interpolated the gross value added by using the simple exponential function  $V_t = (t)^\beta$  where  $t$  is equal to 1 for the year 1982-83 and 18 for 1999-00. By solving the function, we get the value of  $\beta$  as 2.9979. The properties of this function are such that it adequately explains the expansion of courier services in Pakistan; the absolute value grows exponentially with time and as the volume increases, the growth rate declines over time.

As assumed by FBS, we have also assumed that the gross value added of storage is 2% of that of trade.

Combining value added of the three categories described above, we get an estimate of trade, storage and communication at constant prices of 1999-00. In order to convert these estimates into current prices, we have used the consumer price index (transport and communication group).

### 2.2.3.3 Finance & insurance<sup>19</sup>

This sector includes services of the State Bank of Pakistan, commercial banks, discount houses, venture capital companies, exchange companies, etc. We have used the income approach separately for different groups of financial institutions to work out their contribution in the sector's gross value added. Detail of different estimation methods used for various groups of financial institutions is given below.

The State Bank of Pakistan alone contributes 30 percent of total value added of this sector. Domestic and foreign commercial banks have a combined contribution of 39%. We have worked out gross value added of these institutions by adding up establishment cost, depreciation and net surplus available as reported in various issues of Banking Statistics of Pakistan. These estimates are at current prices which have been converted to constant prices of 1999-00 by deflating them by CPI (as per practice of FBS).

The same approach has been adopted in the case of specialized banks and cooperative banks. Data source for these institutions is also Banking Statistics of Pakistan. The institutions included in this group are Agricultural Development Bank of Pakistan (now Zarai Tarqati Bank Ltd.), Industrial Development Bank of Pakistan, Punjab Provincial Cooperative Bank and Federal Bank for Cooperatives.

The other group of financial institutions is DFIs which contributes 6-percent to the gross value added of the sector. Detailed information about DFIs necessary for working out their gross value added is not available, thus we have used growth rate of total assets of these institutions and applied them to benchmark estimates of gross value added in 1999-00. The other institutions covered in the finance and insurance sector are HBFC and other housing finance companies, insurance companies, leasing companies, investment banks and modaraba

<sup>19</sup> The gross value added of finance and insurance has been provincialised on the basis of provincial distribution of employees working in financial institutions

companies, etc. For HBFC, the growth rates in advances and investment during past years have been applied to benchmark estimates of 1999-00. The required data for DFIs and HBFC are available in Banking Statistics of Pakistan. For leasing companies, investment banks, modarabas and insurance companies, we have applied growth of respective market capitalization (deflated by CPI) to benchmark estimates. For the rest of the financial institutions (with share of less than one percent in total value added of finance & insurance sector), we have used growth rate of market-capitalization of finance (overall) as proxy of growth of gross value added. The data sources for these are various issues of Index Numbers of Stock Exchange Securities.

#### **2.2.3.4 Ownership of dwellings<sup>20</sup>**

The estimates of value added in this sector are measured by the rent accruing from ownership of dwellings. This requires data on cumulative increase of houses and their respective rent. The value added of this sector has been estimated by applying growth in imputed rent on benchmark estimates for 1999-00; thus contrary to FBS, our technique not only incorporates the growth of incremental houses but also changes in their rent.

The data needed for this exercise has been taken from two housing censuses of 1980 and 1998, Housing, Economic and Demographic Survey 1973' and Survey of Rent in District Headquarters of Pakistan 1986, both published by FBS.

#### **2.2.3.5 Public administration and defence<sup>21</sup>**

The gross value added of this sector includes wages and salaries, uniform and liveries, bonus and cash awards for meritorious services, and depreciation at the rate of 5% of public

<sup>20</sup> Provincial distribution of imputed rent on dwellings has been used for provincialisation the value added of this sector.

<sup>21</sup> The value added of federal government has been provincialised by the distribution of federal employees on provincial basis. The value added of provincial government has been distributed into provinces on the basis of provincial expenditure on general government

fixed investment. The gross value added in this sector is calculated as follows.

$$V_t = \tilde{W}_t \cdot \left( \frac{W}{\tilde{W}} \right)_{99-00} + 0.05 \times \tilde{I}_t \left( \frac{I}{\tilde{I}} \right)_{99-00} \quad (2.11)$$

value added at constant prices as per new methodology

$\tilde{W}$  = wages and salaries in old series at constant prices

$\left( \frac{W}{\tilde{W}} \right)_{99-00}$  = ratio of wage and salaries measured by two

methodologies in 1999-00

$\tilde{I}_t$  = public fixed investment (in general government sector) as per old methodology

$\left( \frac{I}{\tilde{I}} \right)_{99-00}$  = ratio of public fixed investment measured by two methodologies in 1999-00

The figure 0.05 is the depreciation at 5% of fixed assets.

The above estimates are at constant prices which have been converted to those at current prices by inflating them with CPI.

### 2.2.3.6 Social, community and private services<sup>22</sup>

Income arising in the social, community and personal services sector consists of income of persons engaged in private education, medical and health services, computer related activities, recreational activities and other household and community services. We have estimated the gross value added of this sector as follows:

$$V_t = \tilde{U}_t \cdot \left( \frac{U}{\tilde{U}} \right)_{99-00} + C_t + E_t + N_t \quad (2.12)$$

$V_t$  = value added of SCP services at constant prices as per current estimates

<sup>22</sup> The gross value added of sector has been provincialised on the basis of provincial distribution of employees working in such services

$\tilde{U}_t$  = value added of SCP services excluding hotels at constant prices as per old series by FBS for Pakistan

U = value added of SCP services excluding hotels, computer related services, real estate, NPISH, etc. as per current estimates

$\left(\frac{U}{\tilde{U}}\right)_{99-00}$  = ratio of the two values measured in 1999-00

$C_t$  = value added of computer related services at 1999-00 prices

$E_t$  = value added of real estate services at 1999-00 prices

$N_t$  = value added of non-profit institutions serving households (NPISH) at 1999-00 prices.

The value added of computer related services has been estimated by applying the growth rate of imports of computer related equipment (deflated by unit value index) to benchmark estimates of 1999-00.<sup>23</sup> Data on imports of computer related equipment were obtained from UNCTAD CD-ROM of trade data (2004). For value added of the other two components viz., value added of real estate and value added of non-profit institutions serving households (NPISH), we have applied the fixed growth rates of 3.53 percent and 6.81 percent respectively as used by the FBS. The share of Sindh in the value added of this sector is then estimated on the basis of number of workers engaged in these services as reported by various issues of annual establishment surveys relative to total workers in this sector in Pakistan.

#### **2.2.4 Methodology for forecasting Sindh's Provincial Accounts 2006-2008**

The following time series model has been used to project the Arby (2008) series of Sindh provincial accounts for the years 2005-06 to 2007-08.

<sup>23</sup> The FBS has conducted a census of software industry and related services and estimated benchmark gross value added for year 1999-00. However, such a survey or similar information is not available for past years. So we have used the growth in import of computer related equipment as a proxy for growth in computer related services.

$$1\Delta \log(Y_i^s) = f(\Delta \log(Y_i^p)) \tag{2.13}$$

? represents the difference operator i.e.  $Y_i - Y_{i-1}$   
 (Current year value minus previous year value).

$Y_i^s$  Value Added of  $i^{\text{th}}$  sub sector of Sindh provincial accounts.

$Y_i^p$  Value Added of  $i^{\text{th}}$  sub sector of national accounts of Pakistan.

Essentially the relationship shows that the growth of the provincial account in the  $i^{\text{th}}$  sub sector is a function of the growth rate of the corresponding national sub-sector. We have assumed a log linear relationship in the growth specification i.e.

$$\Delta \log(Y_i^s) = \mathbf{a} + \mathbf{b}(\Delta \log(Y_i^p)) + \mathbf{e} \tag{2.14}$$

The above relation is chosen because most of the series in Eq. (2.14) appear to contain a unit root at their levels,  $Y_i^s$  the valued added of Sindh in the  $i^{\text{th}}$  sub sector show unit-root at level and therefore are non-stationary<sup>24</sup>. An incidental advantage of first-difference transformation is that it may make a non-stationary time series stationary. Therefore we have used the above transformation by first taking natural logarithms and then taking difference of the logarithm

$$\Delta \log(Y_i^s) = \log(Y_i^s) - \log(Y_{i-1}^s).$$

<sup>24</sup> a stochastic process is said to be stationary if its mean and variance are constant over time and the value of the covariance between the two time periods depends only on the distance or gap or lag between the two time periods and not the actual time at which the covariance is computed. In the time series literature, such a stochastic process is known as a weakly stationary, or covariance stationary, or second-order stationary, or wide sense, stochastic process. A time series is strictly stationary if all the moments of its probability distribution and not just the first two (i.e., mean and variance) are invariant over time. If, however, the stationary process is normal, the weakly stationary stochastic process is also strictly stationary, for the normal stochastic process is fully specified by its two moments, the mean and the variance.

These specifications represent the growth rate of the  $i^{\text{th}}$  sub-sector constituents of gross provincial accounts of Sindh.

**I**n some cases where national data is also estimated using survey estimates of some benchmark year, we retain these assumptions and forecast according to the figures estimated on the national basis. Table-2.5 presents the regression results obtained by using EViews software for the Sindh provincial GPP and its components, estimated using national GDP at factor cost at constant 1999-2000 prices.

**Table 2.5 : Summary of equation estimated for forecasting Sindh Provincial product**

$\Delta \log(Y_i^S)$	Constant	$\Delta \log(Y_i^P)$	Adj. R <sup>2</sup>	Durbin Watson stat	F-Stat
Gross Provincial Product	-0.0048 (-0.8441) <sup>1</sup>	1.1375 (10.044)	0.7517	2.5622	100.8828
Total Agriculture	0.0110 (1.4137)	0.6827 (3.4270)	0.2456	2.7147	99.8824
Major Crops	-0.0050 (-0.3021)	0.7556 (3.6108)	0.2673	2.7190	13.0380
Minor Crops	-0.0075 (-0.7152)	0.9651 (3.5958)	0.2655	1.8156	12.9298
Livestock	0.0264 (7.4492)	0.7630 (6.7894)	0.5775	1.2219	46.0972
Fishing	-0.0126 (-1.9119)	-0.0126 (16.5429)	1.0696	1.0696	273.6705
Forestry	-0.034 (-0.5488)	1.024 (4.526018)	0.371	3.286	20.4848
Total Industry	-0.0097 (-2.1101)	1.1655 (15.4113)	0.8776	2.1753	237.5081
Mining	0.0158 (12.8527)	0.9696 (67.3659)	0.9956	1.3529	4538.1660
Large scale Manufacturing	-0.0001 (-0.10813)	1.0152 (88.5612)	0.9959	2.3236	7843.0920
Slaughtering	0.011 (1.180678)	1.412 (15.30718)	0.917	1.886	234.3099
Construction	0.0083 (2.16157)	1.0324 (23.8030)	0.9449	1.5508	566.5838
Elec. Gas and Water	-0.0083 (-1.2225)	1.0879 (18.552)	0.9123	2.8178	344.1813
Total Services	-0.0183 (-3.3424)	1.3214 (14.252)	0.8597	2.2908	203.1350
Finance & Insurance	0.0076 (2.0057)	0.9075 (36.6460)	0.9760	1.6055	1342.9340
Public Admn. & Defence	-4.3871 (-4.2744)	1.2498 (14.779)	0.9158	0.7845	218.4318
Trade, hotels & restaurants	-0.004396 (-0.7365)	1.11909 (10.7302)	0.7757	2.2371	115.1386
Trans., Storage & Comm.	-0.002 (-0.14528)	0.939 (4.9158)	0.537	1.973	24.1655

Note: Small scale manufacturing sector is estimated as fixed growth rate of 7.5% since FY 2000.

<sup>1</sup> Figures in parenthesis are t-statistics.

The coefficient of Pakistan's GDP (f.c.) growth is statistically significant. The value of the parameter a coefficient is 1.137, interpreted as follows if Pakistan's GDP growth increased by 1 percent, Sindh's GPP growth increased by 1.137%. By using the same specification we have computed estimates for all the sub-sectors of the Sindh's economy. The above estimated specification explains 76% of Sindh GPP's growth variation by using Pakistan's GDP growth as regressor (independent variable). The estimated equation does not show any econometric problem (autocorrelation, heteroscedasticity etc.).

The estimates are particularly robust with high adjusted coefficients of determination ( $\overline{R^2}$ ) for Sindh (a) large scale manufacturing (b) mining (c) construction (d) electricity and gas distribution (e) total industrial value added (f) finance (g) public administration and defence and (h) total services sector net output. On the other hand, the fit is weak for major and minor crops and for total agriculture sector value added. Levels of significance of regression coefficients in these cases are also relatively low. Our agriculture – especially crop sector forecast are thus subject to wide margin of error.

Estimated regression coefficients are greater than unity in the case of (a) Sindh's GPP (b) total industrial value added (c) large-scale manufacturing (d) construction (e) Electricity Gas and Water (f) total services sector value added (g) Public Admn. & Defence (h) Trade, hotels & restaurants. In these sectors and sub-sectors growth in Sindh responds more than proportionally to national stimulating.

### **2.3 Integration with the National Economy**

Integrating the provincial segments of the economy with the national economy should be an important policy objective. The higher the level of this integration the greater the likelihood of pursuing national self reliance as a viable policy objectives. The higher the level of national economic integration, the more resilient the national economy would be in facing to global shocks. Moreover enhancing national integration can be an effective

means for ensuring equity in the nation wide distribution of assets and income. In an integrated national economy, development in any one province contributes to the growth of output, employment and investment in other provinces.

In this section we present some tentative estimates reflecting the extent of the integration of the Sindh provincial economy with that of the rest of Pakistan. We begin by estimating a regression relationship between changes in the growth of Sindh’s gross provincial product (GPP) and the gross national product GNP of Pakistan excluding Sindh’s GPP using time series data for the period 1972-2005<sub>2</sub> (Farooq Arby’s GPP of Sindh estimates for 1972-2005) were used. Statistically significant results are shown in table 2.6.

Dependent Variable: DLOG(SINDH)  
 Method: Least Squares  
 Date: 05/28/09 Time: 14:14  
 Sample (adjusted): 1972 2005  
 Included observations: 34 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.005952	0.008349	0.712897	0.4811
DLOG(PAKISTAN-SINDH)	0.919579	0.170109	5.405818	0.0000
R-squared	0.477320	Mean dependent var		0.047809
Adjusted R-squared	0.460986	S.D. dependent var		0.024808
S.E. of regression	0.018213	Akaike info criterion		-5.116297
Sum squared resid	0.010615	Schwarz criterion		-5.026511
Log likelihood	88.97705	F-statistic		29.22287
Durbin-Watson stat	2.519610	Prob(F-statistic)		0.000006

The explanatory power of the equation (48 percent) is reasonably high for growth variables. Secondly, the estimated regression does not show any econometric problem. The regression coefficient can be interpreted as follows; if the growth rate in Pakistan minus Sindh GPP is raised by 1 percent, this increases the growth rate in Sindh's GPP by 0.91 percent. It may be noted that when Sindh's GPP was regressed on Pakistan's Total GDP, higher values of the regression coefficients and coefficient of determination were found (see table 2.5). Regressing Sindh's GPP on the sum of the GPP of other three provinces produces somewhat weaker results, however the positive relationship between growth of Sindh's GPP and the GPP of rest of Pakistan is vindicated.

To find the link between provincial accounts and national accounts, we used granger causality test. Granger causality test is a technique for determining whether one time series is useful in forecasting another. The  $Y$  and regresses it on its own lagged values and the lagged values of another variable  $X$ . Thus, serial correlation in the pair of variables is "washed out" and all that remains is the correlation between them. If the coefficients attached to the lagged values of  $X$  are significant, then  $X$  is said to "Granger-cause"  $Y$ . The results are sensitive to the number of lags chosen.

Results are presented in the appendix tables which show that there is no statistically significant causal relationship between :

- Growth of Pakistan GDP minus Sindh GPP and Sindh's GPP
- Pakistan growth of agricultural value added minus Sindh's agricultural value added and Sindh's agriculture value added.
- Sindh's growth of agricultural value added and agricultural value added of the rest of Pakistan
- Pakistan minus Sindh's services sector value added growth and Sindh service sector value added.

- Sindh's services sector value added growth and the growth of services sector value added of the rest of Pakistan.
- The rest of Pakistan manufacturing value added growth rate does not cause manufacturing value added growth rate in Sindh.
- Sindh manufacturing value added growth rate does not cause manufacturing value added growth rate in Pakistan.
- GPP growth in Punjab and GPP growth in Balochistan do not cause GPP growth in Sindh nor does GPP growth in Sindh cause GPP growth in Punjab.

On the other hand there is a weak causal relationship in the following cases:

- Sindh GPP growth causes GPP growth in rest of Pakistan
- Sindh GPP growth causes GPP growth in Punjab
- NWFP GPP growth causes GPP growth in Sindh

We also ran regressions to evaluate the relationship between growth of Sindh's GPP and that of the other three provinces and found:

- A strong relationship between growth of GPP in Sindh and Punjab. A 1% increase in Punjab's GPP is accompanied by 0.67% increase in Sindh's GPP.
- A weak but statistically significant positive relationship between the growth of Sindh's GPP and the GPP growth of NWFP. A 1% increase in NWFP GPP is accompanied by a 0.19 percent growth in Sindh's GPP.
- A moderate relationship between the growth of Sindh's GPP and the growth of the rest of Pakistan GDP. A 1% growth of Sindh's GPP leads to 0.51 percent growth in the rest of Pakistan GPP.

The granger causality test results are vulnerable to the following limitations. The absence of significant causality between Sindh's GPP and that of other provinces may be due to several reasons (a) The available data is too short for this kind of analysis (b) Data is based on annual observations (c) and provincial level GPP also have various gaps (due to non-availability of primary data), as we have estimated from national benchmark estimates.

Nevertheless the results are not encouraging. Only the growth in the NWFP's GPP causes growth in Sindh GPP. The growth of trade and population transfer between Sindh and NWFP is clearly beneficial to Sindh. Otherwise growth in Sindh GPP is not seen to be caused by growth in the rest of Pakistan's GPP or by value added growth in any of the economic sectors. On the other hand, there is a weak causal relationship showing that Sindh GPP causes growth of the rest of Pakistan GDP and growth in Sindh agricultural value added causes value added growth in Punjab's agriculture. Regression estimates show much stronger association between growth of Sindh GPP and the growth of GDP of the rest of Pakistan – particularly the GPP of Punjab and NWFP.

Overall these are weak and inconclusive results. Nevertheless, it is clear that both the federal and the provincial government must take steps to enhance the integration of Sindh with the rest of the national economy. Equally important is the need to strengthen economic integration within the province. We would have probably found no causal relationship between the growth of production and value added in Karachi and growth of production and value added in the rest of Sindh's economy. A major difference between the pattern of growth in Sindh and Punjab is the difference in the extent of integration of the respective provincial economies. Growth in Karachi does not spill over into the rest of Sindh and does not enhance either investment or employment growth in the rest of Sindh. This is a primary cause of the growing inequality of income and asset distribution in Sindh. Reducing that distributional inequality should be a major provincial concern of the government of Sindh.

**Table A.3 Estimated Regression Sindh and Punjab**

Dependent Variable: DLOG(SINDH)  
 Method: Least Squares  
 Date: 06/10/09 Time: 10:07  
 Sample (adjusted): 1972 2005  
 Included observations: 34 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.015786	0.007430	2.124791	0.0414
DLOG(PUNJAB)	0.722007	0.150171	4.807898	0.0000
R-squared	0.419405	Mean dependent var		0.047809
Adjusted R-squared	0.401262	S.D. dependent var		0.024808
S.E. of regression	0.019196	Akaike info criterion		-5.011214
Sum squared resid	0.011791	Schwarz criterion		-4.921428
Log likelihood	87.19064	F-statistic		23.11588
Durbin-Watson stat	2.200579	Prob(F-statistic)		0.000035

**Table A.4 Estimated Regression Sindh and NWFP**

Dependent Variable: DLOG(SINDH)  
 Method: Least Squares  
 Date: 06/10/09 Time: 10:10  
 Sample (adjusted): 1972 2005  
 Included observations: 34 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.033560	0.008050	4.168926	0.0002
DLOG(NWFP)	0.301978	0.147291	2.050213	0.0486
R-squared	0.116104	Mean dependent var		0.047809
Adjusted R-squared	0.088483	S.D. dependent var		0.024808
S.E. of regression	0.023685	Akaike info criterion		-4.590928
Sum squared resid	0.017951	Schwarz criterion		-4.501142
Log likelihood	80.04578	F-statistic		4.203373
Durbin-Watson stat	2.330799	Prob(F-statistic)		0.048611

**Table A.5 Estimated Regression Sindh and Balochistan**

Dependent Variable: DLOG(SINDH)

Method: Least Squares

Date: 06/10/09 Time: 10:11

Sample (adjusted): 1972 2005

Included observations: 34 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.043867	0.007274	6.030887	0.0000
DLOG(BALOCHISTAN)	0.071331	0.106290	0.671101	0.5070
R-squared	0.013879	Mean dependent var		0.047809
Adjusted R-squared	-0.016937	S.D. dependent var		0.024808
S.E. of regression	0.025017	Akaike info criterion		-4.481488
Sum squared resid	0.020027	Schwarz criterion		-4.391702
Log likelihood	78.18530	F-statistic		0.450376
Durbin-Watson stat	1.958016	Prob(F-statistic)		0.506972

**Table A.6 Granger Causality Sindh and Punjab**

Pairwise Granger Causality Tests

Date: 06/10/09 Time: 10:13

Sample: 1971 2005

Lags: 1

Null Hypothesis:	Obs	F-Statistic	Probability
DLOG(PUNJAB) does not Granger Cause DLOG(SINDH)	33	0.10836	0.74431
DLOG(SINDH) does not Granger Cause DLOG(PUNJAB)		1.47747	0.23365

**Table A.7 Granger Causality Sindh and NWFP**

Pairwise Granger Causality Tests

Date: 06/10/09 Time: 10:14

Sample: 1971 2005

Lags: 1

Null Hypothesis:	Obs	F-Statistic	Probability
DLOG(NWFP) does not Granger Cause DLOG(SINDH)	33	3.81271	0.06025
DLOG(SINDH) does not Granger Cause DLOG(NWFP)		2.85597	0.10140

**Table A.8 Granger Causality Sindh and Baluchistan**

Pair wise Granger Causality Tests

Date: 06/10/09 Time: 10:15

Sample: 1971 2005

Lags: 1

Null Hypothesis:	Obs	F-Statistic	Probability
DLOG(BALOCHISTAN) does not Granger Cause DLOG(SINDH)	33	1.18694	0.28462
DLOG(SINDH) does not Granger Cause DLOG(BALOCHISTAN)		4.22660	0.04859

**Table A.9 Granger Causality Sindh and rest of Pakistan**

Pairwise Granger Causality Tests

Date: 06/10/09 Time: 13:00

Sample: 1971 2005

Lags: 1

Null Hypothesis:	Obs	F-Statistic	Probability
DLOG(PUNJAB+NWFP+BALOCHISTAN) does not Granger Cause DLOG(SINDH)	33	0.28179	0.59944
DLOG(SINDH) does not Granger Cause DLOG(PUNJAB+NWFP+BALOCHISTAN)		1.51499	0.22794

**Gross Domestic Product - Province  
wise. (1980-81 prices) (Rs million)**

<b>Year</b>	<b>Punjab</b>	<b>Sindh</b>	<b>NWFP</b>	<b>Balochistan</b>	<b>Pakistan</b>	<b>Per capita Income Rs. (Sindh)</b>	<b>Sindh Share in Pakistan's GDP</b>
1970-71							
1971-72	87,926	52,499	19,584	8,263	168,271	3,592.50	31.20
1972-73	92,803	55,222	20,784	7,995	176,804	3,665.49	31.23
1973-74	96,768	57,779	21,465	8,414	184,427	3,720.17	31.33
1974-75	99,155	57,411	22,891	8,718	188,176	3,585.59	30.51
1975-76	102,374	58,039	22,224	9,411	192,048	3,516.08	30.22
1976-77	104,997	59,758	21,708	8,837	195,300	3,511.63	30.60
1977-78	111,922	64,346	23,658	9,604	209,530	3,667.81	30.71
1978-79	116,721	69,011	25,443	8,928	220,110	3,815.73	31.35
1979-80	123,512	73,034	27,717	9,442	233,705	3,917.03	31.25
1980-81	128,698	79,262	29,643	10,228	247,831	4,123.54	31.98
1981-82	139,383	85,235	31,439	10,599	266,571	4,307.19	31.97
1982-83	147,383	91,542	33,768	11,942	284,667	4,493.32	32.16
1983-84	152,555	97,458	33,808	12,108	295,977	4,646.59	32.93
1984-85	166,946	105,917	36,095	12,721	321,751	4,905.16	32.92
1985-86	176,467	113,409	39,101	13,247	342,224	5,101.60	33.14
1986-87	186,992	116,559	44,679	14,123	362,110	5,093.02	32.19
1987-88	195,556	128,361	46,314	15,090	385,416	5,447.95	33.30
1988-89	204,871	134,717	48,552	15,808	403,948	5,553.83	33.35
1989-90	214,372	139,505	51,414	17,193	422,484	5,586.39	33.02
1990-91	238,991	140,398	47,729	18,884	446,002	5,461.01	31.48
1991-92	256,203	154,410	50,442	19,356	480,411	5,847.53	32.14
1992-93	260,433	153,389	53,743	20,218	487,783	5,657.77	31.45
1993-94	271,160	158,554	58,087	21,295	509,096	5,698.79	31.14
1994-95	287,414	163,325	61,978	22,143	534,860	5,722.28	30.54
1995-96	309,109	171,366	66,320	23,361	570,156	5,855.60	30.06
1996-97	310,411	178,756	67,596	23,103	579,866	5,959.12	30.83
1997-98	321,867	184,724	69,817	23,717	600,125	6,016.99	30.78
1998-99	337,578	190,820	72,419	24,415	625,232	6,063.03	30.52
1999-00	355,641	196,240	73,878	23,894	649,653	6,091.69	30.21

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